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THE DEVELOPMENT OF THE GEOLOGIC ATLAS OF THE UNITED STATES.

BY

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Writing of the early work of the United States Geological Survey, the present Director recently stated: "Under the directorship of Mr. Clarence King prominence was given to investigations of the mineral resources of the Rocky Mountain region in Colorado, Utah, and Nevada . . . . With the change of directorship in 1881 and the granting of authority in 1882 to complete a geological map of the United States, the policy of the Survey was modified, and its work was directed under a very comprehensive plan to the preparation of the required geological map."

At that time there was probably but one man who grasped the full meaning of the phrase "a geological map of the United States," and even under his direction it required years of experiment and study to establish the methods of topographic, geologic, and cartographic work which have produced the first folios of the Geologic Atlas of the United States. It is the purpose of this article briefly to trace the development of those methods, to state their present operation, and to describe the Atlas which has grown from the authority "to complete a geological map" as the oak grows from the acorn.

The topographic base.—European geologists have, as a rule, found military maps of large scale and detailed execution ready for their use. American geologists have, as a rule, been forced to prepare such base-maps as they could. Pennsylvania, for instance, has seen the completion of its Second Geological Survey, although there is even yet no topographic map of the State. But the policy of the United States Geological Survey since 1881 has been to insist that the topographic is the indispensable base-map, and accordingly

topographic surveys have been pushed energetically for fourteen years.

On account of the immense area thus to be surveyed, requiring on the scale of 2 miles to 1 inch about 3,500 atlas sheets of the adopted size, the methods of survey at first selected and later elaborated aimed primarily at economy with accuracy. It has required experience to prove the necessity of characteristic detail as well. The control of the topographic maps was from the beginning accurate, but the sketching which represents the environment of the mathematical points constituting the control was for a number of years broadly generalized. It has now come to be recognized that an *adequate* topographic map is something more than a map based on accurate control; it is one which faithfully describes the character of every feature delineated, be it stream, hill or road; it is one which is so characteristically true to the facts of drainage, relief and culture, that every cartographic detail can be identified with a natural feature, and every natural feature of sufficient magnitude to show on a map of that scale can be recognized. Such a map affords in every square inch numerous points for identification of positions. It is indispensable to the geologist, unless he himself shall turn topographer, but it demands for its execution the highest skill of the topographic artist. It is small cause for wonder, then, that the efforts of the topographers were at first unequal to the task, but it is cause for congratulation that there is now a body of trained men capable of doing the highest class of topographic work.

The classification of rocks.—A geologic map is one which shows the distribution of rocks of different kinds. In the map of the United States many thousand bodies of rocks must be delineated, and a primary problem in planning the Atlas related to the classification of rocks in a manner so simple that it could be easily comprehended and yet so elastic that it should include every possible variety.

Rocks are distinguished by genesis, by age, and by mineral or lithologic character. Accordingly, the classification adopted for the Atlas is primarily genetic; it recognizes igneous rocks, sedimentary rocks, and surficial rocks, the last consisting of the unconsolidated materials widely distributed over the surface of the land by water, ice and wind. Metamorphic rocks are classed as altered igneous or altered sedimentary rocks if their origin be known; otherwise they are classed with the most ancient rocks as of unknown origin.

Within each genetic class rocks are grouped by age. Geologic time is somewhat arbitrarily divided into ten great periods, corresponding as nearly as may be to divisions generally recognized among geologists and palaeontologists. The rocks of each period may be arranged in one or more groups, according to palaeontologic distinctions.

Lastly, the units of the classification are as nearly as may be lithologically homogeneous masses, called formations. A formation is the result of essentially continuous physical conditions. Practically it is the smallest homogeneous subdivision of a heterogeneous rock series which the geologist finds it practicable to map. It is usually limited above and below by formations differing from itself according to the changes of conditions with which its development began and closed. It is recognized only so far from the type locality as it preserves its individual character, and is replaced in the cartographic scheme by another formation, or by several other formations, as the case may be, whenever the distinctive characteristics fail.

Thus a formation is defined by character, and not by the lapse of time. An example will make this clearer. The undertow retreating from a wave-beaten coast sweeps back sand and silt. The sand is dropped near shore; the silt is swept further out to sea. These deposits of sand and of mud, formed simultaneously, are sand and shale when they become rock. If the land subsides the sea advances, and in the course of ages the coarse deposits of sand are spread over a wide area. The corresponding fine deposits of mud are laid down over the sands, always a little behind the advancing sea-front; and when these are brought to view in land-uplifts we distinguish the sandstone and the shale as different formations. Each represents the duration of a physical condition (in this case proximity or remoteness of shore), but the epoch of sandstone making is not distinct from the epoch of shale-making. So great is the variety of littoral conditions that there may be areas where no sand was deposited, and then the shale alone is present; and others where no mud was spread, and then the rock is all sandstone. Nevertheless, the lithologic character of either shale or sandstone being continuous, the formation remains as a unit (an elastic unit) of classification.

The limitation of a formation to the area within which it retains its physical characteristics is a contradiction of the once prevailing assumption that the rocks of the earth's crust are disposed like the layers of an onion, and is a recognition of the fact that

formations are intimately imbricated. They lie one overlapping upon another, merging gradually into a third, or splitting into thin layers which are interbedded with parts of a fourth. Irregularity and change, not regularity and constancy, characterize formations.

The field work.—The threefold classification, by genesis, by age, and by lithologic character, was made the basis of an elaborate scheme for representing on maps the origins, the geologic dates, and the relations of rock formations. But before the color scheme and its application are described some reference should be made to the geologic field work.

When the topographic map of any region has been prepared with accuracy and with adequate detail, the first step toward geologic work has been taken. The geologist ceases to be an explorer; he floats down no unknown canyon toward possible cataracts; but, equipped with the map, he plans his campaign to the best advantage and accomplishes his work with economy of time, effort and expense.

He first seeks to classify the various rocks of the district. He would ascertain the origin of each variety. Is the rock igneous? If so, was it of volcanic eruption, or was it intruded at a depth beneath the surface? Of what period was the eruption or intrusion? How is it related mineralogically to other igneous rocks? How is it related to the deposition of precious metals? Is the rock sedimentary? What, in that case, is its lithologic character? Was it deposited in lake, estuary, or sea? In what direction, and how far distant, was the land from which the sediments came? What was the physiographic aspect of the land, and what events of uplift or submergence introduced and limited the physical conditions determining the genesis of the bed, whether sandstone, shale or limestone? What life did the waters support, and to what period of the earth's history does the rock belong? What deposits of coal, iron, or other valuable minerals, are there in the rock, and how are they related to other rocks of the district? These and many other difficult questions tax the patience, observation, and trained imagination of the geologist as he traces the formations—many, it may be—occurring in a district.

The ease or difficulty of such an examination varies greatly with the nature of the country explored and the complexity of the geologic problems encountered. In the Appalachian ranges of Pennsylvania, Virginia, and Tennessee, the easily recognized sedimentary rocks occur in tilted layers which coincide with ridges

and valleys. The characters of the rocks and their relation to one another are evident to any close observer, but the problems of geographic changes in the remote past which they record are of profound interest and difficulty.

In the bare, precipitous peaks of Colorado and Utah each rock-mass stands out clearly as a part of the denuded skeleton of the earth. Geologic investigations received a great impetus from the ideas gathered by the early workers in this fruitful field. But the history there recorded covers so large a part of the earth's development, the mingling of water deposits with the results of volcanic activity is so general and so complex, the growth and wasting of mountain ranges has so repeatedly taken place in that western region, that many years of patient work lie before the geologists who labor there.

In the northern portion of our country and in Canada some of the oldest known rocks extend beneath the general covering of glacial deposits upon which grows the dense forest. The visible occurrences of the rocks are limited and scattered, while their nature is greatly modified by changes through which they have passed. Here, more than anywhere else, geology requires the services of the most patient, painstaking seeker after truth.

These instances may suffice to suggest the nature of the investigations upon which the Geologic Atlas is based. It is founded on original work of the highest scientific accuracy.

The manuscript for the folios of the Geologic Atlas is begun in the camps which the Survey establishes each season in all parts of the country, the first draft of the map being generally prepared in the field; the final drafts for the engraver's use are made by the geologist after months of office study, or in case he has not the requisite skill, by an expert draughtsman and are submitted for editorial examination and criticism.

The color scheme; Areal Geology.—It is the function of the editor to find modes of expressing, according to a consistent scheme of representation, the diverse facts of many districts and the views of many geologists. He is governed by regulations which constitute the "color-scheme," but he has constantly to remember that clearness and precision of statement are more important than any rules. If in any given area which had been mapped there occurred a broad expanse of gravel, and adjacent to it a stretch of thinly bedded limestone, the representation of these areas by different colors or by different devices would constitute a geological map, printed according to its individual scheme. Assuming that for reasons of economy

but one color could be used, the suggestion lies close at hand, that the rounded gravel should be represented by dots and the bedded limestone by parallel lines, printed, let us say, in ashes-of-roses over the respective areas. Assuming that from some neighboring Vesuvius a lava-stream has flowed across the district; we may remember that rocks which cool from a molten condition readily break into triangular or rhomboidal pieces. Accordingly, a pattern formed of two or three sets of lines crossing in such manner as to form triangles or rhombs will serve to delineate the extent of the lava. It may well happen that in the same region there is an expanse of ancient gneiss, a rock marked by strongly crystalline texture. Seeking a means of expressing this character, we may find it in a uniform tint of color broken by short white dashes placed irregularly to simulate crystals. Thus, then, we shall have distinguished the gravel, a surficial rock, the limestone, a sedimentary rock, the lava, an igneous rock, and the gneiss, a metamorphic rock, by patterns of dots, of parallel lines, of triangles, and of dashes, all in ashes-of-rose color. The use of these suggestive patterns to represent respectively these four great classes of rocks is the fundamental principle of the Survey's color-scheme.

But ashes-of-roses is a delicate tint, and the pattern distinctions in that color would be rather indistinct for a useful map. Color strength and color variety are needed.

The word "color" covers a multitude of effects. To avoid ambiguity I shall use *hue* for that quality of color by which, for instance, blue is distinguished from green; *tint* for the result of adding white light, pink being a tint of crimson; and *shade* for the mixture of a hue or tint with black. Hues, tints and shades, merging from tone to tone of the chromatic scale,—all are colors.

It has long been the practice of makers of geologic maps to use certain colors for certain classes of rocks. For example, igneous rocks are commonly mapped in tones of red, suggesting the ruddy glow which they may once have given forth; but reds also suggest iron ores. Some geologists see sandstone in every spot of yellow on the map; others assume that yellows are used only to represent the more recent formations. Blue is intimately connected with limestone, and gray with coal. But these associations are personal and often contradictory; and even were they generally observed their adoption in any systematic scheme would present almost insuperable difficulties. In the Survey scheme the four genetic rock-classes are distinguished by patterns, in the manner already explained, and therefore the use of colors is freed from the limitations

incident to the application of any one range of tones to a particular group of rocks. Dots, of whatever color, represent surficial rocks; parallel lines, of any shade, delineate areas of sediments; intersecting lines, of all hues, stand for igneous masses; dashes irregularly spaced, whether in lighter or in darker flat-tints, indicate metamorphism. Nevertheless, the geologist may not choose fancy free among the rich pigments of the lithographer's palette.

The sedimentary rocks are more strictly than any others grouped by age. It is of primary importance to distinguish strata of different ages, and it has repeatedly been suggested that the use of colors to represent geologic periods should be in the order of their sequence in the spectrum. This is adopted in the Survey scheme, strata of the oldest period being mapped by ruddy browns, and those of the successively younger periods being indicated by shades ranging through purple, blue, and green to yellow. The standard colors selected are indicated in the following table:

Formations of the	Pleistocene period	Any colors.
"	Neocene period	Buffs.
"	Eocene period	Olive-browns.
"	Cretaceous period	Olive-greens.
"	Juratrias period	Blue-greens.
"	Carboniferous period	Blues.
"	Devonian period	Blue-purples.
"	Silurian period	Red-purples.
"	Cambrian period	Pinks.
"	Algonkian period	Orange-browns.
"	Archean period	Any colors.

It frequently happens that there are many, sometimes a dozen, formations of one period to be mapped distinctly, and this must be accomplished with one color. Two printings are used. The first is a faint flat-tint of the standard color. The second, on the same areas, is a dark over-print of the standard color in parallel lines, which are variously arranged in patterns of light hues with wide spaces, heavy lines with narrow spaces, or light lines and heavy lines in varied alternation. The effect produced is one of many tones of the standard color, which, being aided by the characters of the patterns, are sufficiently distinct, if the standard be dark enough. In consequence of this last proviso all the standard colors for the sedimentary rocks are of dark shades, heavily printed.

The treatment of the sedimentary formations is from certain points of view the least satisfactory part of the color-scheme. It

limits the artistic possibilities and it makes difficulties in bringing out those formations which for various geologic reasons it is often desirable to emphasize. But the method possesses two very great advantages: By the use of one standard color for each period all the formations of any one period are grouped and the broad facts of distribution become strikingly conspicuous; and the employment of the same color in many maps to mean the same period of the earth's history, associates the color and the period so that the one suggests the other, just as a Continental uniform recalls the Revolutionary war.

Of igneous rocks, only a few marked types are distinguishable by the naked eye, but the varieties recognized by the microscope are very numerous, and new ones are constantly appearing. With all colors available for their representation, there has as yet been no attempt at a systematic scheme, and the colorist is free to choose according to the conditions of color-association in any particular map. The use of brilliant hues for igneous rocks is a natural result of the employment of shades for sedimentary strata, and reds are generally preferred, but there are many exceptions.

In the northwestern region of the United States there are thousands of square miles of lava, called basalt, for which orange is a preferred hue. But one shrinks from causing the Geologic Atlas to burst into flame. A delicate shade of warm dove color serves better as a setting for smaller expanses of other colors, as may be seen in the Lassen Peak folio.

In maps of the Gold Belt of California a standard shade of blue indicates large areas of sedimentary rocks of Carboniferous age; it cries out against a bright red for the lava-flows which buried and preserved the stores of gold in the ancient gravels, and these igneous rocks are accordingly printed in a subdued shade of pink. For further contrast, other igneous rocks are represented in these sheets by tints of golden-brown.

In the Livingston (Montana) folio the shades of standard red, blue, and green required to delineate strata of certain periods produced a map of sombre tone, which was lightened by introducing tints of violet and yellow for the igneous rocks. Examples might be multiplied to show the advantage of freedom in coloring the distribution of this great class of rocks, but the object is merely to indicate the principles which govern the application of the color-scheme.

The surficial deposits and the metamorphic rocks of unknown origin have not yet been mapped in sufficient variety to call for any

special consideration. For the former a color-scheme is demanded by the students of the Glacial epoch and its records. It will be long before our knowledge of the latter taxes the possibilities of the art of map-making.

I venture to outline certain reasonings, in no wise new, which may appropriately govern color associations—at least in maps where distinctness is essential.

Of the three primary colors, red, yellow, and blue, each is the complement of the mixture of the other two, and the strongest possible color contrasts exist between the primaries and their complements. Thus:

Red contrasts with green.

Yellow contrasts with purple.

Blue contrasts with orange.

In this statement it is assumed that the green is composed of equivalent proportions of yellow and blue hues of equal intensity. It is obvious, then, that if the green should be more strongly tinged with blue its proper contrast would be the red correspondingly tinged with yellow; or if the green be of a yellowish hue, the red should have an equivalent admixture of blue. Therefore, as we pass from blue to green, the complementary hue tones from orange to red; grading from green to yellow, the opposite effects range from red to purple; whereas between yellow and orange the contrasts vary from purple to blue. These contrasts of primary and secondary colors are extremely effective, and may be avoided or selected as the occasion demands.

The same idea may be carried a step farther with less gaudy effects if we assume a standard green, a purple, and an orange, and oppose each of them to a neutral mixture of the other two. Thus:

Green contrasts with russet or ruddy-brown.

Purple contrasts with citrine or golden-brown.

Orange contrasts with olive or greenish-brown.

It is convenient to define russet as any combination of purple and orange; citrine, as any mixture of orange and cream, and olive, as any mingling of green and purple. To obtain a standard series, scales of russets, citrines, and olives were prepared as follows:

Standards of green, purple, and orange were obtained with ultramarine blue, cadmium yellow, and madder lake, and these were mixed in pairs in carefully measured volumes. The mixtures varied: in russets, from 5 of orange and 1 of purple by additions of 1 volume of purple to 5 of orange and 5 of purple, and then by subtrac-

tions of 1 volume of orange down to 1 of orange and 5 of purple; citrines and olives being similarly mixed, there resulted a range of hues which is definitely graded and affords the most pleasing color associations available for the maps.

Reference has been made only to the contrasts of brilliant hues, but luminosity is a quality of hues and tints in which they differ among themselves and which distinguishes them strikingly from shades, and these effects also enter into the consideration of color-schemes. In this paper, however, the subject of chiaroscuro must be dismissed without discussion.

Economic geology.—The areal geologic maps resulting from this color-scheme are of dark, strongly marked tones. They are open to the objection that geologic facts obscure those of topography, and to the more serious criticism that the mineral resources of any district are not particularly emphasized. The needs of the scientist and teacher are, however, served by such a map, which presents clearly the facts of geologic history, and any attempt to modify the representation in order to fit it to the wants of the mining engineer lessens its usefulness for this important purpose. But the processes of lithographic printing permit, without serious expense, the reproduction of the patterns employed in the areal map, in weaker tints. Accordingly, for all districts where the mineral resources justify the duplication, the areal map is printed in fac-simile, but in faint tints, and upon this base are distributed stronger colors, which represent the limited areas of productive formations. This may be better understood through an example.

In the Appalachian coal field the strata of the Carboniferous period are sandstones and shales, some of which contain valuable coal beds, while many others do not. These strata constitute formations, which are mapped on the areal geologic map in patterns of dark blue which distinguish the areas of each one from those adjacent to it, but which do not especially mark those that bear coal from those that do not. In the faintly colored fac-simile of the areal map all these patterns are reproduced, their differences being apparent on close examination; but the extent of the valuable coal-bearing formations is strongly brought out by additional flat-tints of one or more obvious shades.

In publishing such an economic map there is risk that its meaning will be misunderstood. It is necessary to point out the distinction between formations that contain useful minerals and those which, containing useful minerals, can be worked profitably. The former can be determined by observation, and the fact remains con-

stant; the latter can be ascertained only after consideration of commercial conditions, which fluctuate, and influence the conclusion accordingly. The maps issued by the Geological Survey indicate the constant facts of mineral occurrence only; the variable facts of value lie in the province of the mining engineer.

Structure sections.—A geologic structure section is a drawing which shows the profile of the surface cut by a vertical plane and the relations of rocks traversed by that plane below the surface.

In some areas the formations which are delineated upon the areal and economic geologic maps extend over the surface and are underlain flatly by other strata; elsewhere the formations dip beneath the surface. Stratified deposits in any one locality usually hold a somewhat constant relation, each one to its associated strata. Upon the basis of this relation, if the occurrence of any stratum at a definite point on the surface is known, the relative position of any other stratum beneath the surface may be inferred. This is true whether they lie in horizontal or tilted positions. The approximation of these inferences to facts varies greatly; in simple cases their exactitude has often been proved by the sinking of shafts; in more complex structure unexpected disturbances are often exposed by mining, and the inferences drawn from surface appearances are shown to be erroneous. In igneous and metamorphic formations guesses at underground relations are purely hypothetical. Nevertheless, in the numerous cases where structure sections may be constructed with confidence, their value is manifold. In regions where strata carry coal, iron, oil, natural gas, or water under artesian conditions, a knowledge of the depth at which the valuable material may occur is of prime importance to development. And even elsewhere, in districts which yield no valuable mineral, inferences as to the structure of the earth's crust are of the highest scientific interest.

Accordingly, in the Geologic Atlas a sheet is arranged to delineate the distribution of formations underground as well as on the surface. It is called the *structure* sheet. Like the other geologic maps, it is based on the topographic map, but in the interest of clearness contours are omitted, and the representation of areal geology is generalized. Across this simplified geologic map one or more sections are printed, each one immediately next the line which indicates its geographic position. The space required for each section (a strip usually about an inch wide and a number of inches long) is obtained by omitting so much of the map. Thus in one view the structure sheet exhibits in horizontal plan or map

the surface distribution, and in vertical section the underground distribution, of formations.

Descriptions.—The verbal descriptions in the Geologic Atlas are under three heads: there is a general explanation of the plan and subject matter of the Atlas; there is a geographic and geologic description of the region portrayed in the maps of each particular folio; and on the margin of each map is an explanatory legend, stating the meaning of the various conventions printed on the sheet.

The necessity for these elements of the Atlas arises on the one hand from the complexity of the subject treated, in a work at once so broad and so detailed, and on the other hand from the fact that few Americans are familiar with good maps. Railroad maps, State maps of small scale, county maps of large scale but no detail, and the maps of foreign atlases are the sources of geographic knowledge. A map which delineates not only every road and house, but also the form and elevation of the surface, is valued when understood, but is not understood until explained.

A feature of the exhibit made by the Survey at the Cotton States Exposition at Atlanta is a lithographic press, printing the Atlanta atlas sheet for free distribution; but the topographic map of this historic region where Sherman marched was but a maze of brown, blue, and black lines to the general public, who left it in constantly growing piles. In course of time an extended explanation of the work of the Survey and of the nature of the map was added on the back of these sheets, and finding in the verbal statement matters they could understand, the visitors carry away the maps by hundreds.

The general explanation of the scope and subject matter of the Atlas, that which is printed on the inside of the cover, was more critically prepared than any other part of the folios. At least twenty-five of the leading geologists in the United States contributed to the discussion of the first draft, and their suggestions were embodied in a copy which was repeatedly revised by Major Powell personally, or under his direction. The resulting explanation appears in the first twenty folios officially signed by him as Director.

The publication of this fundamental though elementary statement led to still further discussion, in consequence of which Mr. Walcott caused a rearrangement of the material and also a change in rock classification. In the former scheme, metamorphic rocks, even of known origin, were set apart as a separate class. In the now adopted classification sedimentary-metamorphic and igneous-

metamorphic rocks are placed under the heads of sedimentary and igneous, respectively. There will long remain, more particularly among the more ancient formations, metamorphic rocks whose origin is not determined; these are grouped as Archean and unclassified crystallines.

In the prolonged discussion and repeated modification of this statement of geologic A, B, C's the condition of the science is illustrated. Through independent investigations, through official surveys, and particularly through the training and labors of many students in the great universities, geology is growing so fast that the text-book is superseded before it is off the press, and the explorers of to-day can only point the way for the advance to-morrow. Little geologic work is final yet. The Geologic Atlas is no exception, but, if kept abreast of knowledge up to the time of publication of each folio, it will contribute greatly to the progress of the science.

The special descriptions contained in any folio may relate to the province in which the district lies and to the particular district, or only to the latter. The manner of treatment has varied with authors and regions, there being no fixed rules to govern the analysis and arrangement of the geologic facts. In some cases the geologist in charge sums up the general history of the province and his assistants write separately of the details; in other cases the general history is incorporated in the account of local phenomena. But with this desirable freedom of treatment there is a rigid requirement as to style: the descriptions shall be so written that any intelligent person, though not conversant with geology, may follow their meaning. If in the interest of scientific precision technical terms become necessary, there shall in the interest of popular readers be an adequate explanation of them. The aim is to fit the folios for use as educational instruments, rather than primarily as scientific contributions. While no less truly scientific, they shall be practically useful. Huxley, who assumed as his life work the task of rendering science in popular terms, set a standard and left an ideal to be striven after.

The legend on the margin of a map is a classified list of the facts delineated therein and of their representative symbols.

It has been aptly said that a museum should be a collection of labels illustrated by specimens. This may be paralleled with much truth by saying that an atlas should be a series of legends illustrated by maps. According to the former statement, a curator knowing his particular subject should compile a consecutive series of labels

and then seek specimens to put with them; and according to the parallel, the geologist should first classify and summarize his facts in a legend before proceeding to express them on a map. Mentally this is the procedure, but the reduction of the mental legend to visible form is usually carelessly done. It is as though an author wrote in Russian, and handed a reader ignorant of that language a fragmentary dictionary. In the Geologic Atlas much attention is given to the preparation of the legends, with a view to classify correctly and to summarize adequately the essential features of the topography and geology in each area.

The technical processes.—The Geologic Atlas in its present form is the result of copper engraving and lithographic printing in a division of the Survey established for the purpose. The technical execution is the very best, and has been made possible only by complete control of the processes through a chief engraver, whose interest prompts his ingenuity, which has never yet failed in adapting methods to the demands of geologic representation. Under the contract system elsewhere prevailing in Government work, the elaborate experiments, the frequent revision of proofs, and the uniformly high standard of published maps would be impossible, while the cost would exceed that at which the folios are now produced.

The basis of the work is the topographic map, for which three copper plates are engraved. On one plate are cut all the data to be printed in black on the map; another receives all the lines to be indicated in blue; and a third, all the lines appearing in brown. To print the topographic maps an impression is transferred from each of these plates to a separate lithographic stone, which is placed in the press and inked with the appropriate color. Every sheet of paper is then run over the three stones, receiving three distinct impressions, which constitute it a map. In all such printing it is essential that each impression should fit exactly with all other impressions.

The geologic data are likewise engraved on copper and transferred to lithographic stone; the elaborate patterns are transferred from copper plates or from stone to other stones, with great precision, and the fourth or fifth proof sent to the editor is a map printed in all the selected colors from as many stones. There may be only a few colors; there may be twenty or thirty. Each one requires a separate printing, and each printing must exactly fit all the others. To pass a large sheet of paper twenty times through the press and each time to place it within a hundredth of an inch of its

previous position is difficult, and in handling 4,000 to 5,000 copies a day the most expert feeder occasionally fails. But in the matter of register (as this fitting is called), and in cleanness, sharpness, and precision of execution, the maps of the Geologic Atlas of the United States challenge comparison with any other work in this country or in Europe.

THE AMERICAN ASSOCIATION.

The American Association for the Advancement of Science held its 44th meeting in Springfield, Mass., beginning with the Council meeting on August 28. The amendment of the Constitution which was proposed at the last meeting, whereby a new section was to be added,—J, Geography,—was not adopted by the Council owing to the insufficient number of papers on strictly geographical subjects. Papers which would have been assigned to this section were read in Section E or in Section H.

At the first general session, on August 29, the President-elect, Professor Edward W. Morley of Cleveland, was introduced and replied in earnest and appropriate remarks to the addresses of welcome from the Mayor of Springfield and the President of the Local Committee.

Dr. D. G. Brinton, the Retiring President of the Association, although unavoidably detained in Europe, forwarded his presidential address on "The Aims of Anthropology" to be read before the Association. Dr. Brinton designated anthropology as a branch of human learning which undertakes to make a study of man's nature, "its needs and its weaknesses, and how best to satisfy the one and amend the other." In the address the term anthropology was used in the sense adopted by this Association, that is, to include "the study of the whole of man, his psychical as well as his physical nature and the products of all his activities whether in the past or in the present." The study of man in relation to his physical traits, his ancestors, and his environment, might be called "biology as applied to the human species," and it forms the basis of the study of ethnography or the division of man into races or varieties. The author referred to the psychical traits of man as being even more important than the physical characteristics, in this study. The psychical or mental nature of man is shown in his works, his social and religious customs and in all his arts, whether for use or ornament. A comparative study of the results of man's psychical nature must be carried back to prehistoric times. "The most ancient is the simplest and the simplest is the most transparent and therefore the most instructive." Dr. Brinton stated that from the study of this branch of anthropology,—prehistoric archæology,—we have learned that the earliest man was the lowest man, the nearest to the brute creation, and have therefore disproved the theory that

"the primal man had fallen from some high estate." He dwelt upon his belief in the "psychical unity" of man, "The parallelism of his development everywhere and in all times." He believes that "scarcely anything but his geographical environment, using that term in its broadest sense, seems to modify the monotony of his creations."

The author also drew attention to the importance of the study of folk-lore in reconstructing the story of the past.

The "immediate aims" of anthropology were summarized as follows: "The collection of accurate information about man and men, about the individual and the group as they exist now and as they have existed at any time in the past; here where we are and on every continent and island of the globe."

Dr. Brinton urged the importance of instruction and training on the part of those engaged in exploration and research in the various fields of anthropological science. He mentioned the fact that heretofore our universities and institutions of higher learning have given no attention to this line of instruction,—"how to observe, how to explore and collect in this branch."

The division of ethnology was defined as the "application of the principles of inductive philosophy to the products of man's faculties." "Its aim is to compare dispassionately all the acts and arts of man, his philosophies and religions, his social schemes and personal plans." While firmly believing in "culture identities," Dr. Brinton denies that all races are equally endowed. Differences of physical characters and of mental temperaments and inherited tendencies necessarily cause distinctions between the various ethnic groups; and a careful study of these peculiarities is one important aim of modern ethnology. This he considers the practical side of the science of anthropology, and it is only upon the results of this study that true legislation of a people can be founded. The science of anthropology has for its practical aim the increase of higher civilization, drawing upon the past as well as the present for a knowledge of the results and the forces which will best contribute to hasten the progress of civilization. Dr. Brinton believes that in the future, political economy, like history, will have to be rearranged on lines which this new science dictates. The final aim of anthropology he describes as offering to man "a knowledge of what he has been and is . . . revealing the future by the unwavering light of the past . . . conducting him by sure steps upward and onward to the highest summit which his nature is capable of attaining."

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Seven Vice-presidents delivered addresses in their respective sections. Major Jed. Hotchkiss of Staunton, Virginia, Vice-president of Section E, spoke on the "Geological Survey of Virginia, 1835–1841, its history and influence in the development of geological science."

Mr. Frank Hamilton Cushing of Washington, Vice-president of Section H, read an extremely valuable paper on the "Dynasty of the Arrow." Mr. Cushing gave a sketch of his long and patient study of the arrow, beginning at the age of ten years, when a ploughman tossed him "a little blue flint arrow point and said, 'The Indians made that; it is one of their arrow heads.'" This little arrow point, he said, impressed him so deeply that it decided the purpose of his whole life. After making a collection of some hundreds of relics, he began a series of experiments to learn how the arrows were made. These experiments were described and illustrated during the lecture. While yet a boy he succeeded in making flint implements of the same form as those made by the primitive people; but he did not at the time know that he was the first white person to discover the method of making these crude implements. He attributes his success largely to the fact that he worked with the same rude tools and materials, and chanced to follow the same course that primitive man must necessarily have followed in fashioning his implements. From these experiments, continued for many years, and from his researches and his life with "an archaic people," Mr. Cushing was able to give the most interesting and concise account of the primitive method of making arrows. He narrated in detail the curious customs and superstitious ceremonies which attended each step of the process. The arrow, he said, is one of the most ancient things that men have made, much more ancient than the bow, and for ages it held remarkable sway over the destinies of man. Mr. Cushing then demonstrated how early man must have soon discovered the advantage of fastening his stone point into a handle, and thus have discovered the handled tool, and later the spear, the harpoon, the dart-flinger, and the bow. From his own experience, Mr. Cushing is convinced that palæolithic man of the French caves, who is supposed to have known no other art than that of rudely breaking a stone into shape by blows of other stones, could not have long remained in this rude state.

Professor F. W. Putnam, Permanent Secretary, spoke extempore in Section H on "Some Symbolic Carvings from the Mounds of Ohio, principally from the Turner and Hopewell groups," and gave

certain conclusions drawn from long continued comparative study. To Mr. C. C. Willoughby, his assistant in the Peabody Museum, credit was given for valuable work in connection with this study during the past year. The colored diagrammatic drawings which illustrated the remarks were the work of Mr. Willoughby. One of the specimens chosen for illustration was a remarkably fine piece of incised work on the polished surface of a piece of human femur. An enlarged drawing plainly showed the motive of the carving which comprises human and animal faces, ovals, circles and other symbolic designs. At first glance a hopeless medley of lines, this carving finally resolves itself into several distinct masks and head-dresses together with the serpent and sun symbols. Professor Putnam considers it an interesting and significant fact that the designs on this carving are repeated in the forms of objects found in the same mound. Among these were many designs "cut from thin sheets of copper made by hammering nuggets of native copper," and several of them correspond with the designs in the carving. The most striking resemblance was found in one of the masks which, in the carving, is surmounted with a head-dress in the form of a deer's antlers, while in the mound was found a skeleton having over the skull a head-dress of copper and wood made in this same form with the branching antlers. Several other specimens were alluded to and illustrated. One on the arm bone of a man represents several animal heads interwoven in a curious manner, and over each head are the symbolic designs, ovals and circles, common to nearly all the carvings. These lines are arranged in such a fashion that portions of each head form part of another above or below, and the reverse of the carving shows still different heads. Another specimen shows the conventionalized serpent, and the bear totem as represented by the five claws. Others represent artistic conventionalized forms of birds and animals. A serpent cut out of mica was found to have symbols carved upon it which are identical with those upon the pieces of bone. Two duplicate carvings on circular portions of the parietal bones of a human skull, Professor Putnam considers really fine work; and Mr. Cushing stated that certain symbols in this carving represent the Zuñi gods of day and night.

Special reference was made to the stone known as the Cincinnati tablet, and Professor Putnam said that this specimen, although often described as a fraudulent piece of work, was undoubtedly genuine, since "several of the strange figures carved on the stone are of the conventionalized serpent form common in the mounds of Ohio and also agreeing essentially with the serpent head symbol on the old

stone sculptures of Central America, which resemblances were not before known." This stone was also shown to have lines identical with those on a piece of copper found in the Hopewell group. In connection with the plumed serpent Professor Putnam and Mr. Willoughby have made many comparisons showing the modifications in the representations of the serpent in ancient art, from Ohio through the pueblo tribes of the southwest to Mexico and Central America.

While the primary object of his remarks was to "illustrate some of the peculiarities of the art of incised work of the older people of the Ohio valley, and to point out the close resemblance in the motive of the symbolism expressed in the carvings from this region with those of the southwest and even of Central America," Professor Putnam touched also on the question: Who were the builders of the ancient earth-works of the Ohio valley? He emphasized, first, the necessity of distinguishing between these old earth-works, and the mounds and village sites of later intrusive tribes from the northward and eastward. Second, he called attention to the fact that the elaborate and intricate designs and delicate workmanship of the carvings he had illustrated necessitated a high degree of skill, ingenuity and patience for their conception and execution, combined with a certain religious cult expressed by the symbols in the carvings, and he claimed that no such work had ever been done by the dolichocephalic tribes of the northern and eastern portions of the United States, nor had any such specimen ever been found in the burial mounds of later date. Third, a study of the skulls and skeletons found in the old mounds and earth-works shows that the builders closely resembled the people of the southwest and of Mexico and Central America, and differed from the long-headed stock of the east and north. His convictions, after more than twenty-five years of exploration and study, are that the builders of the old mounds and earth-works of the Ohio valley "were probably a branch of the great southwestern people represented by the ancient Mexicans, the builders of the old cities of Yucatan and Central America, and some of the pueblo tribes of Utah, Colorado, Arizona and New Mexico and adjoining portions of old Mexico." He believes that a few particular customs, ceremonies and phases of art, found among the living tribes to the northward and eastward of this great region, are simply survivals by contact of these tribes with the short-headed peoples of the southwest, of which stock he considers the old earth-work builders of the Ohio valley to have been one extreme branch.

The close relation between geography and anthropology was

shown in a paper read in Section H by Dr. William Z. Ripley on "A Study in Anthropo-geography as a branch of Sociological Investigation." Colored statistical maps illustrated the geographical method of study, and showed the influence of geology and topography in affecting the distribution of the ethnic elements. Without reference to these maps an abstract of the paper would be unintelligible.

Mr. Gardner G. Hubbard's paper on Japan, read in Section E, began with a description of the physical geography of the islands forming the Empire of Japan. Reference was made to the unusual facilities for commerce afforded by the numerous inland waters, bays, gulfs and harbors. An account was given of the former and present races of Japan; and of the government of Japan from a period prior to 1850 down to the present constitutional form of government. The question was discussed, whether it is wise for the Japanese to adopt our form of government or modify their own by ours. Attention was drawn to the rapid growth of the mining and manufacturing interests of Japan and their probable effect on the manufactures and trade of England. "Japan" it was said, "can easily supply the Pacific Coast with manufactures, while the Pacific Coast and the Gulf States, through the Nicaragua canal, can supply fruits, provisions, grain and cotton to Japan, thus supplying a large outward and homeward commerce for our vessels plying the Pacific Ocean."

Mr. Horace C. Hovey presented in Section E an interesting paper on the Isles of Shoals. These islands, he stated, were discovered by Captain John Smith in 1614, and were originally called Smith's Isles. They are nine in number, and nine miles from Portsmouth light. Five belong to Maine and four to New Hampshire. In 1800 the group was surveyed, showing Appledore Island to have 350 acres; Star Island, 150 acres; Haley's Island, 100, and the others less area. There is a light-house on White Island. Haley and Malaga are joined by a sea wall, making a safe harbor. Mr. Hovey has made preliminary investigations on these islands with the intention of continuing the study in the future. Among his contributions to the knowledge of this group is the statement that Star, Haley, Cedar and Malaga islands seem to be steadily rising at the rate of six feet in fifty years, while the others of the group are either stationary or sinking. He called particular attention to a singular column on Appledore Island. "The column protrudes through biotite gneiss, softer than itself, and the gneiss lies between walls of white granitic rock harder than itself." The diameter is

eleven feet, and the original height was probably from twenty-five to fifty feet. It is strictly hexagonal. He also described a striking dyke of porphyry on Cedar Island stretching from shore to shore; and stated that garnets from one to four inches in diameter are found on Appledore Island.

Professor William M. Davis gave one of the evening lectures tendered by the Association to the citizens of Springfield. His subject was, "Geographical Development of the Connecticut Valley," and the lecture was profusely illustrated with fine lantern pictures. He first described how the valley was formed, and called attention to the fact that the lowland, which extends from 15 to 20 miles in width at Hartford to that of a few miles, or even a mile or less at the north and south, is a very industrious region with thriving cities and towns like New Haven, Hartford, Springfield, and others, while in the upland to the east and west are found rural dwellings, old country roads, and often dilapidated and deserted farm houses. We find that the people of the upland send their children to the lowland for their education, and the census reports show that during the past few years the population of the upland has been slowly decreasing, while that of the lowland has been increasing. These facts show us how geographical features have their effect on the condition of man, physically, mentally and socially.

Professor Davis described the upland as an old mountain chain worn down to a comparatively even surface, with here and there a high peak like Monadnock, which has not been worn down as much as the other portions owing to the hardness of the rock. The valley, he said, means that the highland having been once reduced to the sea level has been raised up and the streams have cut through making the valleys. The valley is deep where the stream comes from an upland which is high; and the breadth of the valley depends upon the nature of the rock. The Connecticut Valley is very broad and deep because the sandstone through which the stream flows is soft and easily washed away.

The second evening lecture was given by Mr. Cornelius Van Brunt on "The Wild-flowers of the Connecticut valley." The primary object of this lecture was to exhibit the series of beautiful lantern slides made from photographs taken by Mr. Van Brunt and colored from nature by Mrs. Van Brunt. As each familiar flower appeared on the screen the lecturer made running remarks on its geographical distribution, habits and peculiarities.

The third public lecture was given by Professor A. S. Bickmore

on the Illustrative Method of teaching Geography and Zoölogy at the American Museum of Natural History in New York City. This new method of "visual instruction" has been introduced into the public schools of New York State. It is given by means of lectures accompanied by pictorial illustrations. The sum of $25,000 a year for three years beginning with January 1, 1895, has been appropriated by the State of New York to provide the means of carrying on this instruction under the superintendence of Professor Bickmore of the American Museum, who gives his services without compensation to this good work.

The Springfield meeting, although not large in the number of attendants, was pronounced an important and successful one. The forty-fifth meeting of the Association will be held in Buffalo, beginning on Monday, August 24, 1896, under the presidency of Professor Edward D. Cope.

TOPOGRAPHY AND SCENERY OF NORTHERN INDIA.

A LECTURE BY

HERBERT M. WILSON.

Though the subject of my lecture is the topography of India, I shall not confine myself strictly to that theme lest I should weary you with dull details. After briefly describing the general topographic characteristics of India, I propose to acquaint you in greater detail with the topography and scenery of the Himalayas, the grandest mountain range in the world, and one of which the people of this country know the least.

In shape India resembles a great triangle, whose base is the Himalaya Mountains, while its apex juts far south into the Indian Ocean. Its western side is washed by the Arabian Sea and its eastern by the Bay of Bengal. It extends from the 8th to the 35th degree of North latitude, from near the hottest regions of the equator to well within the temperate zone. Its length from north to south and its greatest breadth from east to west are both about 2,000 miles. The total area of the peninsula, including British Burma, is about 1,560,000 square miles, of which 965,000 square miles is composed of 16 provinces directly under British administration, the remainder being divided into about 150 feudatory states which, equally with the British provinces, acknowledge the paramount sovereignty of the British crown. In addition to these there are on the west coast, Goa, Diu and other small Portuguese possessions, including 1605 square miles; and Pondichery and several other small possessions of the French, including 203 square miles.

Outside the presidencies of Bombay and Madras, the principal British provinces include Bengal, the Northwest provinces, Punjab, Burma, and others. Among the native states are Kashmir, Rajputana, Gwalior, Jodhpur and others in Northern India, and Travancore, Mysore and the Nyzam's dominions of Hyderabad in Southern India. The total population of India is 287,000,000 of people, of whom 221,000,000 reside in British territory and the remainder in the native states.

India includes within its borders a great diversity of topographic features. It possesses the greatest continuous mountain range, the highest mountain peaks and some of the mightiest rivers and broadest plains in the world. On the north, the Himalayas, which name

means "dwelling place of snow," form a great mountain barrier which shuts out the rest of Asia and forms a controlling factor in the climate and physical geography of India. This range of mountains is 1,500 miles long and may be likened to the Sierra Nevada, bordering the eastern side of the California Valley in its general appearance and topographical relations to the Indu-Gangetan Valley. Behind this range is a high plateau, comparatively arid and corresponding to the Nevada deserts east of the Sierras. While the elevation of Mt. Everest is 29,002 feet, other mountain peaks above 20,000 feet in elevation abound in all parts of the range. There are numerous well-travelled trails leading across the Himalayas through Kashmir and Nepal to Tibet and China, the passes on which are from 15,000 to 19,000 feet in elevation, and in journeying over these the traveller remains for days at altitudes above 13,000 feet.

The second great topographic division of India is the valley or rather plain of the Ganges and Indus rivers, lying immediately south of the Himalayas, and between them and the third topographic division, the Deccan, which includes all its lower or peninsular portion and consists of an elevated high plateau strewn with many irregular mountain ranges and mesas.

The foothill slopes of the Himalayas rising to the northward of the great Indu-Gangetan plain may be described as consisting of two series of ridges or spurs, the first and lower called the Siwalik Hills, varying in height from 3,000 to 4,000 feet. These are low ridges running parallel to the main trend of the Himalayas and separated from them by a disconnected line of valleys from 2,000 to 2,500 feet in altitude and called the Duns. Above and north of the Duns rise the first spurs of the Himalayas, which ascend abruptly to what may be described as a bench, having along the whole southern face of the Himalayas a generally uniform altitude of 6,500 to 7,500 feet. This bench is sometimes called the Sub-Himalayas and from it the long sloping spurs rise gradually and rapidly to the higher summits of the main mountain range.

The Great Northern Plain, through the centre of which flow the Indus and Ganges rivers, lies, as I have before said, immediately south of the Himalayas. The Indus, rising to the northwest of the centre of the Himalayas, flows southwestwardly toward the sandy deserts of Sind. The Ganges and its principal tributary, the Brahmaputra, drain the southern and northeastern slopes of the Himalayas. The former flows through a great plain a thousand miles in length, and the latter through the valley of Assam for a distance of

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several hundred miles to its junction with the Ganges near Calcutta.

As before stated, the great Gangetan plain and its neighbor, the Himalayas, at once remind the traveller of the California Valley with the Sierra on one side, and on the other the Coast Range, which has its counterpart in the Vindhaya Mountains separating the great plains from the Central Indian plateau. Sind (the Lower Indus Valley) is similar in many of its topographic features, and particularly in its soil and climate, to that portion of Southern California and Arizona through which the Colorado River flows. Were the precipitous bluffs and the various mountain ranges bordering the edge of the Colorado removed so that that river flowed through the deserts at a level with the surface of the surrounding country, we would have an exact duplicate of the Indus Valley.

Central and Southern India has its counterpart in the United States in the canyons and mesas of northern New Mexico and Arizona. Great buttes and table lands stand out with bold precipitous sides above the surrounding valleys and plains, the hills being covered with a thick growth of small, scrubby trees, while the valleys are comparatively barren of vegetation other than grass and small brush.

The lower portion of the peninsula consists of a slightly elevated plateau bordered on the north by irregular ranges of mountains, the Vindhayas, varying in elevation from 2,000 to 5,000 feet above the sea and separating it from the northern plains. The eastern and western edges of this plateau are bordered along the coast by two mountain fronts or plateau edges called the Ghauts, (meaning "steps.") Of these the western Ghauts are the higher and more continuous, the slope and drainage of the peninsula being from these, eastward to the Bay of Bengal.

And now let us assume that we have landed in Bombay, the second city in India, and that at which the traveller first arrives after journeying through the Suez Canal and the Red Sea from Europe. Bombay is situated about midway north and south of the west coast of the peninsula; thence radiate railway lines northward to the Indus Valley and Afghan frontier; northeastward to the great valley of the Ganges and to Calcutta; eastward to Madras, and southward to Travancore. We might take rail to Calcutta, near which place, at Benares, a railroad branches northward to the foot hills of the Himalayas, whence a short journey over a steep, narrow-gauge railway, would take us into Darjeeling, one of the summer hill stations of the British Government, under the shadows of Mts. Everest and Kanchanjangá. By preference, however, we will take

the Baroda line, which goes due northward through the Central Provinces of India, and after stopping at Ahmedabad for a detour into the Indus Valley, we will continue northward to the Himalayas, which we will reach near the point where the Ganges leaves them. From this point a short journey over excellent hill roads will convey us to Simla, Mussoorie or Chakrata, hill stations of the Government. Here we plunge into the higher Himalayas, across which we will proceed into Tibet, and back along the head-waters of the Indus into the Indus Valley west of Simla.

While the street scenes of the new quarter of Bombay are interesting to the European, and we are astonished at the magnificence of the Government buildings constructed by the British, the most interesting part of the town to us is, however, the native quarter, where we are for the first time introduced to native architecture, though in its least attractive and most business-like form, and to the unique and curious costumes of the inhabitants of India. A few of the streets of the native portion of Bombay are broad, while all are well paved. Though we here see some of the peculiarities of native architecture as represented in stores, and some of the strange costumes of the people, the city is so Europeanized that we scarcely realize that we have reached an Oriental land.

Having satisfied ourselves with Bombay and prepared for our journey, we proceed to the Victoria Railway station, one of the most magnificent railway buildings in the world, made of solid sandstone and marble, elaborately carved and adorned with statues. The waiting-room in the interior of this building is constructed of variegated marbles and onyx, highly polished and carved by native workmen into quaint shapes of indigenous animals and birds.

As our train hurries us out of Bombay, we at once begin the ascent of the Western Ghauts, a long, rugged range of low, wooded hills which border the western coast of India, and in passing through which we view some of the most magnificent railway scenery in the world. The summits of these hills, which are of volcanic rock, are from two to five thousand feet in altitude, and consist of mesa-like mountains similar to those of the central arid region of this country. The arid valleys between the hills generally contain streams which are utilized for the irrigation of the land, while the hills themselves are clothed with a scrub brush or jungle of low trees, and are occasionally surmounted by forts and castles, from which the native chiefs once dominated the surrounding region.

Continuing northward, we pass the summits of the Ghauts and enter the great Central Plateau, which is practically level, though

broken occasionally by irregular ranges of hills, mesa-like in shape. The whole of this country is well inhabited by an agricultural people, who laboriously raise their crops from the arid soil by the aid of irrigation, the water for which is largely supplied from wells and storage reservoirs. After a short journey, we reach Ahmedabad, where we obtain our first view of a truly native city. Ahmedabad is noted for its carpet-weaving industries and the manufacture of silk and textile fabrics. Its stone and cement buildings are adorned with magnificent wood carvings, the most beautiful in India, and from this neighborhood handsome carved screens, chairs and sandal-wood boxes are exported.

At Ahmedabad let us make a detour westward into the lower Indus Valley, in order that we may examine some of the peculiarities of its topography. East of the Indus, in Rajputana, we enter one of the most dismal and forbidding deserts in the world. It consists of shifting sand dunes, constantly moving with every wind and banking up against the few rocky hills which protrude through them. Yet, dreary as is this region, water is found here and there in wells, and it supports a scattered nomadic population.

Continuing to the Indus Valley, we observe the erratic course of the river, and are impressed by the density of the population and the level character of the plain. This country is similar to that along the lower Colorado and Gila rivers in the neighborhood of Yuma. To the west of the river we see the foothills of the low mountain range which separates India from Baluchistan and Afghanistan, and in which are found the celebrated passes of Quetta and Kohat into which the British have built railways toward Afghanistan.

Proceeding now directly to the Ganges we observe that its great valley is well watered. It is as level as and may be well likened to the Mississippi Valley and that of the Sacramento. It is densely inhabited by a people who subsist on the products of agriculture raised by means of irrigation from the grand canals which traverse it. Crossing this valley, we disembark at Rurki, at which place the Ganges Canal is carried over the Solani River in a superb masonry aqueduct. From this point a short journey up the Ganges Canal takes us to Hardwar, one of the Holy Cities of the Hindu people, situated at the point at which the Ganges bursts through the last foothill range of the Himalayas and enters the plain. Here is diverted the great Ganges Canal, which waters about 5,000,000 of acres in the valley below. Hardwar is a pretty little city, situated on the banks of the Ganges and nestling among the rocks of

the Siwalik hills. In it are to be seen all the varieties of Indian architecture, as each religion in its turn has left its mark upon the buildings. To this place flock annually hundreds of thousands of pilgrims, who come to throw the ashes of their dead into the river, to bathe in its holy waters and to be absolved of their sins at such price as the Brahman priests think they are capable of paying. A unique sight on the Ganges at Hardwar is a milkman, whom we see here floating to market on a raft, consisting of eight empty American kerosene oil cans and one other filled with milk. After emptying the filled can he packs all nine on his head and trudges back to his farm in the hills.

Having gotten a brief view of the Ganges at this interesting point, we will proceed by rail directly to Saharanpur, a city of several hundred thousand inhabitants, where we will procure our outfit for the long foot journey through the Himalayas. At our disposal will probably be placed an *ekka*, one of the native, bone-breaking carts of this region, a vehicle without springs, and in which the rider must sit cross-legged on the few slats which form its body. A trial of half an hour, even over the smoothly paved streets of Saharanpur, will convince us that we must use some other form of conveyance. In the distance one of the persistent gharrymen of India, quite as obstreperous as the hackmen of our country, is bringing us a fairly comfortable conveyance, a hack made by native workmen, which has springs beneath it, and in which one can journey with some comfort.

I would be loth to advise any one to use that imposing conveyance, the elephant. Such little experience as I had on these animals was not sufficient to break me in to the roughness of his stride. The ordinary method of mounting him is, as we see, by stepping on his heel, then upon his tail, which a native holds for us, thence by clambering upon his back. After we reach there, however, the worst of the performance is yet to begin, for as he raises first one of his ponderous forefeet and then the other, we sit on an incline more steep, and as it is living, more terrifying than the steepest roof in New York. In another moment up comes one of his hind feet, which throws us at an awkward angle, then he raises the other, and, if we have managed to cling to his back through this performance, we find ourselves in a fairly level and comfortable seat. But the moment he starts off we realize all the terrors of elephant travel, for as he lifts each mighty limb in succession, that portion of his body above it rises and falls through two or three feet of altitude, and gives us such a shaking that I can only

liken it, not to a ship at sea, but to such a tossing as the darkies of the South used to be regaled with by our soldiers in war times, when they were tossed in blankets for the edification of the camp.

Having decided to make our journey on horseback, we procure some excellent ponies and a number of porters to carry our baggage (for these native porters, or runners, will travel as fast as our horses and keep up with them all day over hilly roads) and start on our journey. We are at once impressed by the magnificence of the roads, which are built by the British engineers, and stretch for miles between the main cities of India, shaded on both sides by grand avenues of trees.

Let us pause here and glance at the region which we are about to enter. Near the eastern extremity of the Himalayas, in Sikkim and Nepal, to the northward of Bengal, there is no subsidiary range of hills at the foot of the Himalayas. Here the main range is but 60 to 80 miles wide from the Gangetan plain to the highest summit. At the foot of the mountains, between the Ganges and Brahmaputra rivers, is a broad belt of flat, low-lying, marshy country, moist and malarious at all times, and covered with a dense growth of reeking jungle; this region is the Tarai. North of it the Himalayas rise in long, steep ridges, unbroken by cross ranges, directly to the highest summits.

The topography of the central and western Himalayas is very different from and more complex than that of the eastern end of the range. At the foot of the Himalayas are the Siwaliks, a range of low ridges, the trend of which is parallel to that of the main mass of the Himalayas, northwest and southeast, but practically at right angles to the trend of the ridges of the Himalayas, which run from the summits southwestward toward the Gangetan plain. Nearly parallel to the Siwaliks and between them and the lower, or sub-Himalayas, are a series of long, narrow valleys, called Duns. The Siwaliks are from three to four thousand feet in height and the valleys or Duns have an average elevation of two thousand feet.

Beyond the Duns are the lower slopes of the Himalayas proper, which rise continually in long parallel ridges, separated by the various river channels which flow from the mountains, until the extreme summits are reached at altitudes of from 18,000 to 27,000 feet. At from 5,500 to 7,500 feet the regularity of these ridges is broken by a series of hills or knobs separated by irregular flats, and this bench, if it may be so called, is ordinarily styled the sub-Himalayas. On various portions of this bench are the hill stations of Simla, Mus-

soorie, Chakrata and other summer resorts of the Anglo-Indian Government.

Above the sub-Himalayan bench the ridges rise steadily to the summits of the southern or snowy range of the Himalayas, in which are situated Gangotri, Badrinath, Kedarmath and others of the celebrated peaks at the head of the Ganges and Indus rivers, which reach altitudes of from 22,000 to 24,000 feet. To the north of this range, great, deep, V-shaped valleys are crossed, in the bottoms of which run the Sutlej, Chandra and Jehlam rivers and other branches of the Indus, and beyond these are the northern Himalayas, broken up into many irregular mountain masses reaching to altitudes nearly as high as those of the southern range, though the summits of these northern mountains have less snow and ice upon them. North of this northern range are the great table lands of Tibet, Gobi and numerous smaller elevated plains, and west of these are the Karakorum Mountains. Among the highest of the elevated plains is the Hundes—the land of the Huns—which is almost directly north of Simla. The highest portion of this basin reaches altitudes of from 12,000 to 16,000 feet, and is generally a bare, bleak plain in which the Sutlej and Chandra rivers have eroded deep gorges. As seen in bird's-eye view, the Hundes consists of an interminable succession of ravines and steep cliffs, cut deeply in what at a distance appears to be a level expanse of country, in which all the lower ridges and irregularities seem to disappear. It is all of a brownish or greenish-brown color, due to the patches of gravel breaking through the bright green pasturage. In general appearance this region is much like the excessively eroded plateau country along the Musselshell and Yellowstone rivers in eastern Montana and the Little Missouri in western Dakota.

North and west of the Hundes are the Karakorum Mountains, which form the southeastern bulwark of the Pamir. In these mountains are some of the highest peaks of the Himalayas, one of which as yet unnamed, but marked on the Government maps as "K-2," is the second highest in the world, reaching to an altitude of 28,278 feet. South of the Karakorum Mountains are numerous elevated basins, too large to be called valleys, and which yet cannot be called plateaus, as they are surrounded by still greater heights. Of these the Hundes is one, while another, though lower, is the celebrated Vale of Kashmir, about 100 miles long by 50 miles wide and between 5,500 and 6,500 feet in altitude. The slopes of this valley are surrounded by level terraces, apparently old lake shores, below which the valley bottom is of alluvial sand

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and gravel, its centre being occupied by Walen Lake, 6 by 10 miles. The climate of Kashmir is delightful. In spring the valley is fresh, green and smiling and surrounded by a noble belt of glistening, snow-capped mountains. In autumn the eye is filled with a wonderful richness of many-colored foliage, and at all times the placid river Jehlam flows smoothly on between stately groves of plane trees.

While there are many deep gorges cut by the rivers flowing southward from the Himalayas, such as the gorges of the Ganges and Sutlej rivers, these are but mere indentations in the surface of the earth as compared with the enormous depth of the gorges cut by the Indus below Gilgit. In one place the river flows in a narrow canyon, the bed of which is less than four thousand feet above the sea, while the precipices which form its sides rise abruptly to altitudes exceeding 20,000 feet; at Nanga Parbat Peak to a height of 26,620, thus making the canyon below Gilgit from 17,000 to 22,000 feet in depth. Above Gilgit, Rakipushi Peak rises to an altitude of 25,500.

Great varieties of climate are found in the Himalayas. In their eastern portion in Sikkim, the rainfall is very great. It is near here, in Assam, that the greatest precipitation in the world occurs, over 600 inches having been recorded in one year. In their western portion the rainfall is from 40 to 60 inches in the sub-Himalayas, and increases to perhaps 100 inches near the summits of the outer or southern range; thence the rainfall steadily and rapidly diminishes to the northward until there is almost a total absence of rain in the Hundes and north of them toward Gilgit. The climate of Kashmir is celebrated for its mildness, yet just to the north of it the dryness of the air and the depth of the gorges of the Indus and Gilgit rivers allows the sun's rays, beating down on the bare gneiss and sand, to produce an almost unbearable heat. In the higher plateau lands, while the summer temperature by day is excessive, at nightfall it sinks rapidly to many degrees below freezing.

And now let us resume our journey where we left it in Saharanpur. As we enter the Siwalik Hills we observe the character of the sandstone and conglomerate rocks which form them, and the low growth of scrub timber, which reminds us at every turn of the hills of northern New Mexico and Arizona. There are none of those extended views which are to be seen in the higher Himalayas, but there is a soft beauty and richness of sub-tropical flora which these do not possess. The more prominent of the trees are the Sal, a variety of the Lac tree, the Sissoo, Bamboo and many

similar woods. Orchids clothe the trunks of the trees, below and between which is a dense growth of rhododendrons, ferns and other low bushes. The fauna is exceedingly varied, the less frequented portions of the Siwaliks and Duns being a veritable paradise for the sportsman. Of the larger animals, the elephant, tiger, leopard and several varieties of bear are numerous, while guinea-fowl, peafowl, wild duck, jackals, monkeys, wild boars and several varieties of deer abound in the forests of this region.

Passing the Duns and climbing the main range of the Himalayas there suddenly bursts upon our view a magnificent panorama of the foothills in the neighborhood of Mussoorie, one of the most picturesque and characteristic of the hill stations of India, situated at an altitude of about 6,000 feet. From here, or, better still, from the military camp at Landaur, near Mussooree, is obtained, perhaps, the finest view to be had in the whole sub-Himalayan range. Looking across the plain of the Ganges, are seen glimmering in the distance fine threads of silver, which mark the courses of the Jumna and Ganges rivers, while a little straight line, looking like a pin-scratch, represents the great Ganges Canal. Here and there the vast plain is dotted with groups of shining buildings, partly hidden in little clouds of smoke. In the opposite direction, far away in the distance over the intervening mass of forest-covered ridges, the summits of Kedarmath, Gangotri and neighboring peaks rise as mighty masses of whitest snow, towering to altitudes of 23,000 or 24,000 feet, nearly four miles vertically above the point of view. Should we journey by way of Chakrata, we see another pretty European village nestled among the hills and shaded by magnificent deodars (a variety of cedar), maples, chestnuts and oaks. Continuing our journey along the rambling hill roads which wind up the long slopes of the Himalayas, we cast a last look back on the pretty valley on the edges of which nestles Chakrata, and, bidding adieu to civilization, plunge into the fastnesses of the Himalayas. Our road here skirts the rocky cliffs, often built around the edge of such precipices as that on the Chakrata water road.

The few roads which lead through this region never attain to the dignity of wagon roads, but are yet better than the mountain trails of the United States. The grades are so steep and the curves so sharp that they can only be travelled on foot or horseback, and they rarely exceed six or eight feet in width. These trails are, however, well laid out by competent engineers, well-surfaced, and have on them numerous excellent bridges crossing

gorges and ravines. The scenery along some of these roads is the finest of the kind in the world, the roads along the Rogi and Drali cliffs being cut out of sheer precipices of rock, which are several hundred feet almost vertically above the bottoms of the torrents, the cliffs continuing for some hundreds of feet above. At each bend in the road we obtain new views of the distant snowy range, as here we see Kedarmath Peak, 22,790 feet in altitude, nearly 20,000 feet above us, and now not forty miles away.

Beyond the hill stations the country rises steadily and rapidly, and the rivers flow in deep gorges, the beds of which are several thousand feet below the summits of the ridges. The slopes of the latter are clothed in dense forests of chestnuts, oaks and maples, firs, cedars and pines, while here the rhododendrons and holly attain a height of 60 feet. At the highest elevation at which vegetation is found, from 12,000 to 16,000 feet, birch and poplar are among the more common trees, and growing beneath these are gooseberry, currant and other bushes.

At Bharimghatti the cliffs are so rugged that our road leaves the river and crosses the gorge on a wire suspension bridge, 2 feet wide, 300 feet in length and 450 feet above the surface of the water. Here the river is a rushing torrent but a few feet in width and flowing between steep canyon walls. In the bottom of this narrow gorge occasional pretty little flats are found, any of which furnish excellent camping grounds. Some of these are permanently occupied by small settlements of the natives, hardy hillmen, who in their mode of living are not unlike the Highlanders of Scotland or the peasantry of the Alps. And now, as we enter the heart of the higher Himalayas, the canyon widens, its slope decreases, and it loses its torrential character until finally the Ganges becomes a good-sized river, wandering from wall to wall of the U-shaped valley, which, from its cross section, is evidently the result of glacial action. In the distance we get a nearer view of the snowy peaks, of which Srinkata, 22,700 feet in altitude, occupies the commanding position.

From here on for a few miles our path leaves the river valley, crossing a few low passes, from the summit of one of which, near Badrinath, we are suddenly confronted by an imposing wall of granite, Hoonooman Chutte, which is 22,000 feet in altitude. Here we pass ridges which are curiously faulted, inclined or folded, presenting such outcrops as would delight the heart of a geologist.

And now, as we approach the head-waters of the Ganges, we leave all vegetation behind. In places our path skirts the hillsides

far above the stream, in others we are compelled to pick our way over glacial boulders, until at last we reach the final source of the Ganges at Gao-Mukh, the "Cow's Mouth," an ice cavern in which the Ganges heads at the terminus of Gangotri Glacier. The face of the glacier is 300 feet in height, and from this point a magnificent view is had of Gangotri Peak, 22,628 feet in altitude, over many miles of intervening glacier. Looking backward from Gao-Mukh down the Ganges, we see that we are now surrounded on all sides by barren rocks and masses of glacial drift.

In one place our path leads us by the Temple of Badrinath, in view of which is Badrinath Peak, at an altitude of 23,215 feet. This is the most sacred temple of the Hindu people, as the summit of Badrinath Peak is supposed to be the abode of Vishnu, and this is the highest shrine raised to that mighty deity. Skirting Gangotri Glacier near its summit, we obtain a magnificent view of the great masses of snow and ice which constitute Gangotri Peak. Leaving terra firma at this point, and crossing or skirting minor glaciers and snow-fields, we find ourselves encompassed by barren rock and ice until we finally lose all signs of road or trail, and crossing the great glacier by paths known only to our native guides, we ascend the slopes of Phung-Sing-Purbat, with the intention of taking a panoramic view of our surroundings before leaving forever this region of magnificent altitudes.

But let us pause a few moments to consider in detail the topography of this upper region. It consists of massive mountain ranges running in various directions, some northerly and southerly, others easterly and westerly, and dividing the head-waters of the Ganges, Sutlej and Chandra rivers, the latter being branches of the Indus. The heads of the valleys separating these higher mountain ridges are filled with glaciers which are of as great magnitude as they are numerous. The line of perpetual snow ranges between 13,000 and 16,000 feet along the southern chain of the Himalayas, and from 16,000 to 18,000 feet along the northern chain and in the northern Tibetan ranges. Nearly every high valley has its glacier, some of which are of large proportions. A few exceptional glaciers descend to elevations as low as 10,000 feet, the lowest of these being on the southern side of the Karakorum Mountains to the north of Kashmir. Of the large Himalayan glaciers, that of Gangotri is one of the greatest. This glacier has three branches which are respectively five, fourteen and fifteen miles in length. The Mana glacier, not far from this, is sixteen

miles long, while numerous others in this portion of the Himalayan region are from seven to fifteen miles in length.

Returning to our point of view on the side of Phung-Sing-Purbat, we see to the west of us Gangotri Peak, 22,628 feet in height, and to the right of it Kedarmath, 22,790 feet. To the north is seen Hoonooman Chutte, 22,000 feet high, and to the right of it is Barrakoonta, 22,500 feet. To the east is Marapuit, 22,869 feet, and next to it is Badrinath, 23,215, while to the right of them we see Nunda Debi, 25,681 feet, an apparently low hill in the extreme distance. The hill on which we stand, Phung-Sing-Purbat, is 18,600 feet in altitude.

Leaving our point of view, let us pass over a portion of the intervening region to the Karakorum Mountains, which are north of the head-waters of the Indus River. As we traverse these, our way leads over great glaciers, the tributaries of which ramify in every direction as do those of a stream of water. Crossing Hispar Pass at an elevation of 17,650 feet, we obtain a magnificent view of the snow-clad summit of Gusherbrum Peak, 26,378 feet in altitude. Glorious as is this imposing peak, we gaze upon it with sentiments not unmixed with regret, for we are about to turn our steps homeward and leave forever this region of magnificent altitudes. The route which we have chosen takes us to the head-waters of the Sutlej River, a branch of the Indus. This we reach in Buspa Valley at the terminus of a great glacier, from a tunnel in which the Sutlej bursts in a torrent similar to that in which the Ganges heads in Gao-Mukh. Hastening on our return journey, we are greeted with other beautiful views, such as we saw in passing up the Ganges. As we plunge once more into the great forests, we cast a last farewell look upon the snow-clad summits which ever rear their mighty crests, cold and serene, amidst the solemn depths of highest unexplored Cloudland.

THE RECEPTION OF MR. PEARY.

A reception, offered to Civil Engineer R. E. Peary, U. S. N., on his return from the Arctic, by the American Museum of Natural History and the American Geographical Society, took place on the 14th of November, 1895, at the Hall of the Museum, and was very fully attended.

Mr. Morris K. Jesup, the President of the Museum, opened the meeting with the following address:

"LADIES AND GENTLEMEN: As President of the American Museum of Natural History, and representing its Board of Trustees, I bid you a cordial welcome this evening. We meet here to welcome one who has done so much in the cause of science and exploration, and whose courage, patience and endurance reflect credit upon the name 'America.'

"I shall not inflict a speech upon you this evening, but simply perform a pleasant duty, and introduce to you one whom we all love, and whose name is honored wherever known; I have the honor to present the Honorable Charles P. Daly, President of the American Geographical Society and ex-Chief Justice of the Court of Common Pleas."

Judge Daly, who was then invited to take the chair, briefly reviewed the career and the achievements of Mr. Peary as an Arctic explorer, who had not only extended our knowledge of Greenland and mapped parts of it previously unknown, but had also put in practice new and improved methods of Arctic travel and appreciably reduced the perils and uncertainties which beset the conduct of expeditions in the frozen North. How great these perils and uncertainties are and must always be sufficiently appears from the record of Mr. Peary's experience in the last two years when, as we all know, he and his brave companions had to struggle with storms of almost unexampled severity, and to draw back at last worn out by famine, when on the very threshold of success, defeated but not dishonoured. Well might such a leader adopt for his own the lofty words of the Roman:

> 'Tis not in mortals to command success,
> But we'll do more, my comrades—we'll deserve it.

Judge Daly then introduced Mr. Peary, who spoke as follows:

MR. PRESIDENT, LADIES AND GENTLEMEN, MEMBERS OF THE AMERICAN MUSEUM AND OF THE AMERICAN GEOGRAPHICAL SOCIETY.

The present occasion is hardly an appropriate one for me to make any extended demand upon your time or attention, but it seems as if a few remarks might be entirely in order.

Five years ago, while urging before various Societies the advantages of a project for Arctic exploration, I advanced the following statements:

"FIRST.—Interest in Arctic work, discouraged by the sad disasters to the last two expeditions from this country, is at a very low ebb, yet needs only proper encouragement to turn it on the flood again.

SECOND.—Of all Arctic localities, Greenland, the pendant brooch in the glittering necklace of snow-capped lands which circle the North Pole, seems the most interesting. Hidden among its savage mountains lies the key to the secrets of those past glacial periods which helped to form the globe on which we live, and which, according to some scientists, were so stupendous as to even disturb the balance and affect the very revolution and axis of the earth itself.

To the explorer the indeterminate northern extension of Greenland and the unknown northeastern shore from Cape Bismarck to the farthest of Lockwood and Brainard are at once a promise and a reproach. Now that uncertainty as to the interior of Greenland has been cleared up by the journeys of Nordenskjöld, Nansen and myself, and it has been shown that that interior is a great unbroken plateau of snow, it offers an imperial highway to that unknown coastline.

THIRD.—The explorer must precede the savant, and break the trails and discover suitable localities for stations and investigations, in order to enable the latter to do his best work in the least time and at the least expense.

FOURTH.—Nearly all scientific material and collections from the Arctic regions have thus far been obtained by foreign scientists and institutions, and it is time that we on this side of the water should have our share of these treasures."

How has time dealt with these propositions?

Set in motion by my first expedition, the flood of interest in Arctic work has turned so strongly that within the past five years four Arctic voyages have been made, not including the five of my

own ships; two expeditions are still in the field, and two or three others in the stage of promotion.

The northern extension of the mainland mass of Greenland has been determined and the advantages of the imperial highway of the interior shown conclusively. The completion of the gap in the northeast coastline remains yet to be accomplished.

The detailed knowledge of the Smith Sound region obtained by me has enabled me to point out to the botanist, biologist, geologist, and naturalist, the localities most suitable for their special lines of investigation, has permitted one of the first glacialists of the country to reap in a single season a harvest of information and original material in his special field, which had he gone blindly to the country he could not have obtained in two or three, and has more than doubled the amount of scientific material and information from the Arctic Regions in the Museums of this country.

As for my own work, for five years I have strained every energy and put every cent of money I possessed into it.

To say that my motives were entirely unselfish or that I was actuated solely by the love of science, would be incorrect, but I can say that the desire to win an honorable and lasting reputation went hand in hand with the desire to add to the sum of human knowledge. I felt that I saw something possible of accomplishment before me, and I could not rest until I had proved the truth or error of my belief.

The prime object which I saw before me was not the discovery of the North Pole, as many imagined, but the determination of the northern extension of Greenland and the delineation of its unknown northeastern coast. This is a work which President Clements Markham, of the Royal Geographical Society, in his annual address of last year pronounced one of the oldest and most interesting of Arctic problems. The discovery of the Pole itself was a secondary object and conditional upon the northern extension of Greenland or adjacent lands north of it.

The means of accomplishing these objects were somewhat in the nature of a new departure in Arctic work, namely, by overland, or more properly speaking, interior travelling, on a scale never before attempted.

Most of my hearers I assume to be familiar with the general features of my two last expeditions. A very brief résumé may, however, not be out of place. In the summer of 1891, after having passed the previous winter in Whale Sound, on the West Coast of Greenland, in latitude 77° 40 m. north, with a single companion I

crossed the great interior Ice Cap of Greenland, and descended upon the northeastern coast at a point in latitude 81° 37 m. north, and longitude 34° 5 m. west, which I named Independence Bay. Having equipment fitted solely for inland ice work and provisions only for a limited time, I was unable to pursue my discoveries farther either to the southeast to connect with the surveys of the German expedition of 1869–70, or northward along the shores of the detached land masses which I saw stretching away to the northeastward. Returning over the Ice Cap to my headquarters and thence back to the United States in a steam whaler, I devoted the following winter and spring to raising the money for a second expedition to continue the work already begun. By the most strenuous efforts and with the assistance of my friends I was successful in accomplishing my object, and in the summer of 1892 sailed for Greenland again, with a larger party and a more extensive equipment, with the intention of again crossing the Ice Cap to Independence Bay and from there pushing on the explorations with two parties, one going north and northeast, as far as the land extended, the other east and southeast to connect with southern surveys on the east coast.

The start was made in the spring of 1893, but the severity of an exceptionally cold season, and the succession of violent storms upon the great Ice Cap destroyed my dogs, crippled my party, and compelled my return after having penetrated a distance of one hundred and twenty-four miles. Undiscouraged by these mishaps, I started again in the spring of 1894 with only two companions, Lee and Henson, and though but one of the caches of provisions which had been left by me upon the inland ice the previous year, caches which contained the most vital sledge supplies, could be found, the excessive snowfall of the previous year having submerged them completely, I still pushed on and with the utmost difficulty again reached Independence Bay. Loss of strength due to insufficient rations made it impossible for me to advance farther, and reluctantly I was compelled to return to my headquarters, without having advanced any considerable distance beyond my farthest of two years previous.

With my return from Greenland the past summer in a ship sent out by Mrs. Peary through the kindly assistance of the American Museum of Natural History, the American Geographical Society, and other friends, but particularly through the interest and generosity of the President of the former Institution, my audience is familiar.

That I am disappointed in not having accomplished all of my objects goes without saying. That I am shaken in my belief as to

my methods and means does not at all follow. For four years I have kept the Stars and Stripes waving in the Arctic air, and it is through no fault of mine or of my methods that they have not gone farther north and accomplished more, but I am consoled by the thought that few men achieve complete success in any line in one or two or four or five years.

In exploration, as in business, as in letters, as in invention, conditions are entirely different now from what they were years ago. It is no longer possible for the confines of the well-known to be reached by a dash either mental or physical. The days when a Galileo or a Columbus could reach and pass beyond the narrow circumference of the world of mind or matter at any point are past. Whoever would now reach the distant horizon must select his course, pursue it as the crow flies, and consider himself fortunate if, at the end of years, he stands upon the coveted line looking into the unknown and still retains a fair reserve of his strength and energy.

Strange as it may seem to many, in view of the numerous Arctic expeditions that have gone out in the past, Arctic exploration thus far has, with perhaps two exceptions, been carried on in a haphazard desultory manner. Expeditions have been of two classes, Government and private. Let us consider the usual routine of one of the former.

Some scientist with powerful friends, or a coterie of Arctic authorities, advances a project for an expedition and urges it upon the Government. After a considerable time it is favorably considered and the money for it appropriated or granted by the proper authorities. The expedition goes into the field, and after the lapse of one or two or three years, returns. Perhaps returns in safety, but has accomplished little, at least has not in its results come up to public expectations, as was the case with the English expedition of 1875–76; or, it has accomplished much but at a fearful sacrifice, as was the case with our own Government expedition of 1881–82–83. In either event public condemnation and disapproval are the same, instantaneous and pronounced, the Government is averse to opposing this feeling by further efforts, and the matter ends. Ten or fifteen or twenty years later the same routine is again gone through with, but those who led the previous expedition are dead or too old to take the field again; their practical experience is forgotten, very likely an entirely new route or field of effort is selected, and everything must be learned over again.

How is it with purely private affairs, like my own expeditions,

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entirely without Government aid or responsibility? A young, eager scientist or enthusiast, like Dr. Nansen, for example, a believer in the possibility of accomplishing something in a certain way, devotes his own money or that of his friends, or both, to the work. As a rule an expedition fitted out under these circumstances is upon a comparatively small scale, and one voyage is apt to be its limit. For, though free from the effects of public disapproval, it is hampered by the limitations of usually not over plethoric private purses.

The two exceptions to the general rule to which I have referred above, are, FIRST, the systematic and sustained explorations carried on by the English Government during nearly a decade succeeding the loss of the Franklin Expedition. Among the results of these expeditions was the discovery of the northwest passage, the blank void on the charts of the Western Hemisphere north of North America was filled with new lands and seas, and form and shape were given to it as to the interior of Africa within the past decade, and the art of sledging upon the ice of the Arctic Ocean was brought to a state of perfection which has been but slightly excelled since.

SECOND.—The explorations carried on for the last twenty years or more by Baron Nordenskjöld, under the liberal patronage of Baron Dickson. This work being independent of popular approval or disapproval, ill success one year did not prevent its being prosecuted the next. And as a result the northeast passage was accomplished, important explorations were carried on in Greenland, Spitzbergen and other portions of the Arctic regions, and the Scandinavian Museums filled to overflowing with the scientific material and treasures of the Polar World.

Arctic exploration must, like anything else, be made a business, and carried on from year to year, profiting by each added item of experience, taking advantage of every occurring opportunity. That the prosecution of this business should be necessarily expensive, does not by any means follow. On the contrary, my work has shown that it can be prosecuted for a very moderate sum. The amount of money, from $50,000 to $100,000, necessary to fit out an expedition according to the old régime, would now on the plan shown feasible by myself carry on sustained and systematic explorations for five or ten years. In other words, such sustained and systematic exploration as alone can achieve the fullest success, I have shown to be within the means of a single institution of any magnitude or even of a private individual.

Should an American Baron Dickson or Mr. Harmsworth, a second Henry Grinnell, or any one of our wealthy Societies or Institutions take sufficient interest in this work to devote $10,000 per year for ten years to it, the end of that time would, I believe, see every gap in the Arctic map of the Western Hemisphere filled up to and perhaps beyond the 85th parallel, and the Museums of this country richer in Arctic collections than the Old World Museums of London, Copenhagen and Berlin.

My personal efforts for the past four years and my personal fortune are a contribution to the great cause, and have, I believe, opened the door and shown the way to a more fortunate successor. The experience of the past four years has demonstrated the economical basis upon which Arctic explorations can be carried on, and has brought the art of inland ice travel from the state of experiment to the same stage of perfection that the art of sea-ice sledging had attained at the close of the series of expeditions in search of the Franklin party. The command of the unknown East Greenland coast is to-day in the possession of the explorer following my lines of work, at a moderate cost and a minimum expenditure of time, and the same methods offer the simplest means of solving the interesting Ellesmere Land problem by an overland journey.

There is another phase of my work which has a deeply human interest, and that is its connection with and effect upon a very small but extremely interesting tribe, or perhaps I might more properly say, family, of the human race, a little community of aboriginal hyperboreans, the most northerly individuals of the human race, numbering but 257, completely isolated from all the rest of mankind by impassable icy barriers, yet living on, free, happy and independent, from year to year through the long summer day and the great Arctic night. As I stand here talking to you now, I can see them, already within the shadow of the great night, the sun having left them three weeks ago, comfortable and contented in their little stone houses perched upon the shores and bluffs of the frozen Arctic Ocean, with the light from their oil lamps shining softly through the translucent membranes of their windows out into the icy blackness of the night.

The effect of my expeditions upon those children of the North has been to raise the entire tribe to a condition of affluence. The difference between their condition five years ago and to-day can perhaps be best illustrated by asking you to imagine the case of a community or village of farm or day laborers, working at a dollar and a quarter a day and possessing nothing but their wages, and

that each member of this community should have given him a furnished house and lot and a ten thousand dollar bank account. Five years ago many a man in the tribe possessed no knife and many a woman no needle, and so great was their desire for these priceless treasures that on one occasion a man offered me his wife and children for a twenty-five cent pocket-knife.

Few of the men possessed kayaks or skin canoes, and he was indeed well off who had a spear or harpoon shaft made of a single piece of wood. To-day, men and women are amply supplied with knives and needles; every adult man and half-grown boy has his canoe, most of the men have guns and every hunter is supplied with the best of wood for his lance, his harpoon, his seal spear and his sledge. The effect of these improvements in their weapons has shown itself at once in the improved condition of the tribe, resulting from the great increase in the effectiveness of the hunters. The people are better clothed, they can support a larger number of dogs (their only domestic animal), and as a result of their more ample nourishment and consequent greater ability to withstand the constant hardships of their life, the death rate has decreased and the birth rate perceptibly increased within the past five years.

My experience of the past two years has strongly accentuated my previous belief in small parties for Arctic work. The history of Arctic explorations sustains me in this belief. The results obtained by Graah, Greely, Schwatka, Hall, Rae, and others, were obtained by parties of two or three. Many of the sad disasters which form a part of Arctic history would have been avoided had the parties been small. It is a popular fallacy that there is safety in large parties. The entire animus of the Arctic region is against such parties, and in the event of their being thrown, either temporarily or permanently, upon the resources of the country for sustenance, an occurrence that is one of the most certain of Arctic possibilities, the members of such large parties will starve, where a small party would have abundant rations. A coward, a weakling, or an insubordinate man has better opportunity to cause demoralization in a large than in a small party.

In the Franklin expedition, out of a party of 138, not one lived to tell the story of their terrible final days, and I have no doubt that the utter loss of that expedition was due directly to its size. As long as everything goes well, a large party may be all right, but in the hour of disaster or serious disappointment, the trouble begins. Nothing can be more terrible than the retreat and struggle for life of a large party under the fearful stress of the Arctic. It is impos-

sible for a leader, no matter what his qualities, to fill a large party as he can a small one with his own courage and hopefulness. Every individual in the party represents a drain upon the vital magnetism and force of the leader, upon whom the safety of the party depends. Up to a certain point his example is contagious and his cheerfulness, activity and courage are reflected in every member of the party, but when day after day of arduous struggle, of cold, of hunger, and discouragement, have reduced the powers, both physical and mental, the infusion of fresh courage into a desponding one requires as tangible a transfer of the leader's stamina and nerve force, as the filling of a vessel with water from a reservoir, and the reservoir in this case does not refill as rapidly as under normal conditions.

A word or two in regard to the various projects of Arctic work now attracting attention. The English Jackson-Harmsworth expedition which, at last accounts, was safely located at its base of operations in Franz Josef Land with its advance depots well under way, seems most promising. Granted the extension of the Franz Josef archipelago well to the north and barring unforeseen accidents, which are those that usually occur in Arctic work, Mr. Jackson certainly seems in a very auspicious position to far outstrip previous records in the high north. As to Dr. Nansen's expedition, if the recent reports that a vessel, supposed to be the *Fram*, has been seen in the ice off the east Greenland coast, are true, we shall probably hear from him soon. If in the time since his departure, his ship has really drifted to the vicinity of the Pole, he certainly has been most exceptionally fortunate. I have always believed that Dr. Nansen and his party would return from their voyage, hazardous as it seems, but I have always felt that if they returned with their ship, it would be only by the most gracious permission and concurrence of the Arctic ice and the weather demon.

As for the project of Andree, who proposes to reach the Pole by means of a balloon, I can only say that I should personally prefer to wait until the science of aeronautics has been reduced to that exactitude which will permit a man to put on his wings with the same facility and effectiveness that we now don our overshoes or coat. I say this in no derogatory spirit, for I believe we shall ultimately attain to something akin to this, but before that time arrives I believe that the North Pole will be reached by some of the at present recognized methods of locomotion, and if not attained by either of the expeditions now in the field, I believe it will be reached by an American.

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The two great popular objections to Arctic exploration seem to be the waste of money connected with it and the supposedly excessive loss of life. It would seem from the emphatic utterances of some who decry what they consider a waste of money on Arctic work, that they are under the impression that the money expended upon an Arctic expedition is taken north and buried in the snow, becoming an absolute and total loss. It seems to be forgotten that the supplies and equipments of these expeditions are purchased and paid for at home and that they contribute to the support of a certain number of people for a certain time as much as if those people were living at home.

The other objection, that Arctic work means too great a sacrifice of life, loses its force in the light of actual facts. To those familiar with the literature of Arctic exploration it is a well-known fact that the loss of life in this field, even including those expeditions which have disappeared utterly and completely in the savage fastnesses of the White North, amounts to but two per cent. of the total number engaged in the work, a percentage less than that of the annual loss of life among the fishermen and sailors along the shores of the British Isles.

During my own work of the past four years but one life has been lost, and that was the result of an accident in no way connected with the work itself, an accident which would have been likely to occur in the Alps or in any of our own wild mountainous districts.

To those who in the absence of a dollar for dollar return for every effort, ask "Of what earthly use is Arctic exploration?" I might ask "What is the use of yacht races, of international athletic contests, of trials of engines and warships, or any of the innumerable tests that have since the world was young been man's only means of determining the superiority of one man or one machine, or one method, or one nation over another?"

Were I asked to enumerate all the possible advantages of Arctic explorations, I should say frankly I cannot do so any more than I or any one could have said fifteen or twenty years ago that an insignificant grass growing on the banks of a tropical river would make our incandescent electric light a possibility.

Would it be at all strange in a region of the strongest contrasts, where active volcanoes are found surrounded by eternal snow and ice, and where the poppy, symbol of warmth and sleep and luxury, blossoms at the very foot of the icy crags of glaciers, if some material were found which alone would make possible some yet unknown necessity of our future civilization?

However, a question which claimed the lives of such men as Kane, Hall, De Long, Chipp, and Lockwood, of our own countrymen, and Franklin, Bellot, Crozier and many more from across the water, and has inspired the pens of Markham, Petermann, Barrow, Greely, and others, needs no apologies.

There is no page of England's history on which she prides herself more than that on which are inscribed the work and the discoveries of her sons within the realm of Noonday Night, and Midnight Sun, and there is no true American that is not proud of the records of Kane, De Haven, Hayes, Hall, De Long, Melville, Greely, Lockwood, and Schley. The very fact that there is no possibility of sordid motives of gain or conquest, makes this field doubly attractive to noble minds.

Whatever may be said against Arctic exploration, it remains a definite fact that no other portion of the globe possesses such universal attraction for young and old, intelligent and illiterate, weak and strong, as this. And one thing is as certain as that the North Star will continue to shine, regardless of utility or non-utility, the inherent charm of Arctic work and the irrepressible restlessness of the human animal, as long as there remains a corner of the earth unknown to him, will keep up the interest and spur effort in the White North, and maintain it as a field of the highest national as well as individual rivalry, till every square mile of sea and land has been charted.

As to the comment which has been made that my lack of full success during the past year has set the cause of Arctic exploration back indefinitely, did I believe this to be true I should feel the deepest regret; but I do not believe it. On the contrary, I believe I am justified in feeling that it has strengthened interest in that it has shown what can be done even under the most unfavorable circumstances. I believe there never was a time when there was a wider spread or more favorable interest in Arctic explorations than to-day. The reputable press throughout the country, almost without exception, voice this interest and approval, and where they do not it is in most instances the result of a misconception of facts.

Should that Englishman now up in Franz Josef Land outstrip the record which the Stars and Stripes for the past twelve years has held through the courage and energy of Lockwood and Brainard, of General Greely's party, and carry the dragon of St. George farther to the north, I do not believe it would require six months to obtain the necessary sinews of war to start the fairest flag the sun shines on north again to regain its place in the lead.

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In conclusion, a word of acknowledgment to my friends. Never was a man more fortunate in these than I. It would be impossible to enumerate them all, but the Philadelphia Academy of Natural Sciences, the American Geographical Society, the Geographical Club, of Philadelphia, the American Museum of Natural History, and the names of Judge Daly, of General Wistar, of Adams, Bridgeman, Heilprin, Melville, Putnam, and Hurlbut, will not be forgotten.

But there is one who has touched me in a tenderer spot than any other, the one who smoothed the way for the brave woman who bears my name, and last spring, when things looked darkest in her efforts to send a ship for me and my two companions, relieved her intense anxiety by saying: "Give yourself no further uneasiness. I will stand in the gap with whatever amount may be needed to send the ship." The expenses of a voyage to Northern waters can only by the most rigid economy be brought below $10,000. And in spite of the generosity and assistance of the American Museum, the American Geographical Society, and other friends, as a matter of fact more than one-half the costs of the voyage were borne by this one.

The princely giver to whom I refer is Morris K. Jesup, President of the American Museum of Natural History, the man who during the fifteen years that he has been its head, has made the Museum what it is to-day, the pride of every New Yorker, and is still urging it upward and forward at the constantly accelerating speed that alone can enable it to keep pace with the first city of the Occidental Hemisphere.

WASHINGTON LETTER.

WASHINGTON, DEC. 20, 1895.

For the first time in the history of the Geological Survey, the annual report of the Director is submitted and printed to date. Always the most attractive of the Governmental reports, it is this year more so, on account of the information it has of the latest results of the important interests under its control.

Speaking more directly of its geographic work during 1895, it is to be noted that $159,200 was allotted to topography. Of this amount it was provided by law that $35,000 should be expended west of the 97th meridian, and one-third of the remainder west of the 103d meridian. The proportion allotted to New York was $10,000, to Georgia, South Dakota, Nebraska and Oregon the same, to California and Colorado $20,000 each, to Texas $12,000, and to eleven other States smaller sums.

This being the first report of Charles D. Walcott, the successor of Maj. John W. Powell, who successfully organized and for fourteen years directed the large and highly important operations of the Survey, it is gratifying to know that the new Director did not find it desirable to make any radical changes either in the policy or personnel of the administration. The changes made have been in the nature of readjustments intended to meet new conditions. These readjustments, briefly outlined, are: the raising of the standard of quality of the topographic map; the representation on all maps hereafter surveyed in the public-land States, of the land-subdivision lines, and, when possible, the location of the position of township and section corners, and the determination of their altitude; the enlargement of the work of resurvey of areas, the existing maps of which are, from any cause, defective or inadequate for the proper representation of the areal and economic geology; the planning of a system of triangulation to supplement that already done by the Coast and Geodetic Survey and by the Geological Survey.

The topographic branch of the Survey has two divisions, viz.,

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Triangulation and Topography. The latter division made surveys during the season of 1894–95 in twenty-one States, viz.:

STATE.	SCALE OF PUBLICATION.		CONTOUR INTERVAL.
	1:62500	1:125000	
	SQUARE MILES.	SQUARE MILES.	FEET.
Maine	500	..	20
Vermont	750	..	20
New York	750	..	20
Pennsylvania and New Jersey	1,000	..	20
West Virginia and Maryland	..	1,500	100
Virginia	..	500	100
Tennessee	..	500	100
Georgia	..	1,500	50
Minnesota	500	..	20
North Dakota	..	2,000	20
South Dakota	..	2,225	20
Wyoming	..	1,000	50
Nebraska	250	4,500	20
Colorado	*575	*3,000	50 and 100
Texas	..	2,350	20 and 100
Idaho	..	2,000	100
Washington	300	..	25
Oregon	..	1,000	100
California	3,175	500	25 and 100
Total	7,800	22,575	..

* Besides 38 square miles mapped on scale of 1:25000.

The following topographic sheets were completed during 1894–1895:

LOCALITY AND NAME OF SHEET.	SCALE.	CONTOUR INTERVAL.
		Feet.
MAINE:		
Sebago Lake	1:62500	20
Bridgton	1:62500	20
VERMONT:		
Strafford	1:62500	20
Pawlet	1:62500	20
Manchester	1:62500	20
NEW YORK:		
Ticonderoga	1:62500	20
Hoosick	1:62500	20
Fonda (part in 1893)	1:62500	20
Lake Placid (part in 1893)	1:62500	20
Ontario Beach	1:62500	20
PENNSYLVANIA:		
Norristown	1:62500	20
Chester	1:62500	20
Philadelphia (revision)	1:62500	20
Germantown (revision)	1:62500	20
MARYLAND and WEST VIRGINIA:		
Piedmont (revision)	1:125000	100

LOCALITY AND NAME OF SHEET.	SCALE.	CONTOUR INTERVAL.
		Feet.
GEORGIA:		
Monroe	1:125000	50
MINNESOTA:		
St. Paul	1:62500	20
Minneapolis	1:62500	20
NORTH DAKOTA:		
Valley City	1:125000	20
SOUTH DAKOTA:		
Huron	1:125000	20
WYOMING:		
Sundance	1:125000	50
NEBRASKA:		
Lincoln	1:62500	20
Hebron	1:125000	20
York	1:125000	20
Superior	1:125000	20
Grand Island	1:125000	20
COLORADO:		
Cripple Creek	1:25000	50
Telluride	1:62500	100
Rico	1:62500	100
Pueblo (revision)	1:125000	50
Walsenburg (revision)	1:125000	50
Nepesta (revision)	1:125000	50
TEXAS:		
Valentine	1:125000	100
Fort Davis	1:125000	100
IDAHO:		
Weiser	1:125000	100
CALIFORNIA:		
Yosemite (part revision)	1:125000	100
Los Angeles (revision)	1:62500	25
Pasadena	1:62500	25
Santa Ana	1:62500	25
Downey	1:62500	25
San Francisco	1:62500	25
Cucamonga	1:62500	25
Pomona	1:62500	25
Redondo	1:62500	25
Las Bolsas	1:62500	25
San Mateo	1:62500	25
San Bernardino	1:62500	25
Anaheim	1:62500	25
San Pedro	1:62500	25

Formerly the manuscript maps, as prepared by the Topographic Branch, were approved and sent to the engraver without special editorial examination or revision. These manuscripts, produced by many men working independently, were unequal in character and quality, and it has been decided to refer to an editor of topographic maps every topographic manuscript submitted for publication. Mr. Marcus Baker, who has served continuously as Secretary of the United States Board on Geographic Names, has been assigned to this position. The work is made to cover not only

new maps, but all the old ones when a revision is to be made for the purpose of printing a new edition, or when any sheet is to be prepared for use as a topographic base for the maps of one of the Geologic Folios. But few of the 900 topographic atlas sheets engraved have had the form or application of the geographic names upon them authoritatively established.

In the matter of the survey and subdivision of the lands in the Indian Territory authorized by the last Congress, the subdivision has not gone on as rapidly as was anticipated, owing to a mistaken idea regarding the character of the country. It was assumed that it was mainly an open country, in which subdivision could be carried on rapidly. As a matter of fact, three-fourths of it are heavily timbered, and not less than one-fourth is mountainous. The timber and undergrowth are commonly so dense as to require continuous chopping in order to open the lines, so that the rate of progress depends upon the rate at which the lines can be chopped out. The open country which is found in the central part of the Cherokee Nation has not yet been reached. In this the work will progress far more rapidly than elsewhere. While the survey and subdivision of this Territory is going on, an accurate topographic map of the country is also being prepared.

For several years the Division of Topography has been engaged in compiling a list of positions determined within the United States which are believed to be of sufficient accuracy for use in the preparation of its maps. As a method of making the compilation of public use, it has been issued as a Bulletin of the Survey, under the title of "A Dictionary of Geographic Positions in the United States. By Henry Gannett." The list comprises between 9,000 and 10,000 positions by latitude and longitude, with abbreviations indicating the authority, and references to the publications in which other data relating to the positions may be found. Ninety-nine per cent. of all the determinations have been made by the Coast Survey, the Geological, Lake, Hayden, Powell, Wheeler, and New York State Surveys, and Mississippi and Missouri River Commissions.

Mr. Gannett describes the work of each of these nine organizations, the parts of the country in which their work has been done, its extent, and the methods employed both in field and office, and characterizes the degree of accuracy which may be expected in their determinations.

An important question has been reconsidered and determined relating to the scale of publication of maps in the Geologic Atlas in the case of States, which like Maryland and those of New

England, have been surveyed on a scale of one mile to the inch. It having been shown that there can be much speedier publication and no corresponding loss of scientific or educational value in publishing on a scale of two miles to the inch, this scale has been adopted for the Geologic Atlas, except in special cases.

Following is a tabulated statement of the present condition of publication of the Geologic Atlas:

GEOLOGIC FOLIOS READY FOR DISTRIBUTION.

NO.	NAME OF SHEET.	STATE.	LIMITING MERIDIANS.	LIMITING PARALLELS.	AREA IN SQUARE MILES.	PRICE IN CENTS.
1	Livingston	Montana	110°–111°	45°–46°	3,354	25
2	Ringgold	Georgia, Tennessee	85°–85° 30′	34° 30′–35°	980	25
3	Placerville	California	120° 30′–121′	38° 30′–39°	932	25
4	Kingston	Tennessee	84° 30′–85°	35° 30′–36°	969	25
5	Sacramento	California	121°–121° 30′	38° 30′–39°	932	25
6	Chattanooga	Tennessee	85°–85° 30′	35°–35° 30′	975	25
7	Pike's Peak	Colorado	105°–105° 30′	38° 30′–39°	932	25
8	Sewanee	Tennessee	85° 30′–86°	35°–35° 30′	975	25
9	Anthracite—Crested Butte	Colorado	106° 45′–107° 15′	38° 45′–39°	465*	50
10	Harper's Ferry	Virginia, W. Virginia, Maryland	77° 30′–78°	39°–39° 30′	925	25
11	Jackson	California	120° 30′–121°	38°–38° 30′	938	25
12	Estillville	Virginia, Kentucky, Tennessee	82° 30′–83°	36° 30′–37°	957	25
13	Fredericksburg	Maryland, Virginia	77°–77° 30′	38°–38° 30′	938	25
14	Staunton	Virginia, W. Virginia	79°–79° 30′	38°–38° 30′	938	25

GEOLOGIC FOLIOS IN PRESS.

NO.	NAME OF SHEET.	STATE.	LIMITING MERIDIANS.	LIMITING PARALLELS.	AREA IN SQUARE MILES.	PRICE IN CENTS.
15	Lassen Peak	California	121°–122°	40°–41°	..	..
16	Knoxville	Tennessee, N. Carolina	83° 30′–84°	35° 30′–36°	..	..
17	Marysville	California	121° 30′–122°	39°–39° 30′	..	..
18	Smartsville	do	121°–121° 30′	39°–39° 30′	..	..
19	Stevenson	Alabama, Georgia, Tennessee	85° 30′–86°	34° 30′–35°	..	..
20	Cleveland	Tennessee	84° 30′–85°	35°–35° 30′	..	..

There is in course of printing, also, a special map of the Cripple Creek mining district of Colorado, which will form a part of the Pike's Peak folio, mentioned above.

The Hydrographic Division of the Survey, Mr. F. H. Newell in charge, has been engaged in the study of water supply and in the measurement of the volume of water in various streams, mainly in the western part of the country. A Bulletin recently issued details the earlier investigations of the Division in the western interior, and Potomac basins; also a list of discharge measurements of various streams in the United States.

The press of the Geological Survey has been one of considerable activity during the sixteen years of its existence, as evinced by its "List of Publications," recently issued. It counts, 16 Annual Reports in 26 large 8vo vols.; 24 quarto volumes of Monographs; 130 Bulletins; 10 volumes of Statistical Papers; about 900 atlas sheets, and 28 special maps; an aggregate of 1018 publications, or about 63 in a year.

Biological Map.—The biological map of North America on a large scale which has occupied the attention of the Department of Agriculture for a few years past now covers, as far as preliminary work is concerned, the greater part of the United States, except eastern Oregon, north and central Nevada, parts of New Mexico and Texas, and some of the Eastern States. In addition, a detailed survey has been made, with a degree of accuracy equal to or exceeding that of the best topographic maps available, of large parts of California, western Oregon and Washington, Idaho, Montana, Wyoming, South Dakota, Utah, Arizona, and a number of the Southern States. This map when completed will show the boundaries of life areas; thus saving large sums of money now expended annually in futile efforts to make crops grow in places climatically unsuited to their needs. They will also be useful in indicating the areas subject to and those exempt from the ravages of destructive insects and other pests, and also those in which certain diseases of plants and animals are likely to flourish. Congress authorized this comprehensive investigation of the geographic distribution of animals and plants in 1890; thus in effect establishing a new survey—a Biological Survey—of the country.

The northern boundary of both arid and humid divisions of what is known as the Austral zone (which covers the southern tier of States and much of California) has been followed completely across the continent. This zone is considered of the greatest importance because of the large number of valuable crops that grow within it.

The preparation of this very practical map is in charge of the Division of Economic Ornithology and Mammalogy of the Department of Agriculture; of which Dr. C. Hart Merriam is the Chief. Secretary Morton says the name of this Division is unfortunate, as it conveys an erroneous idea of the nature of its work.

A national map on a large scale, to show all the macadamized and gravel roads in the United States, is another new undertaking of the Department of Agriculture. Upon this map new roads are laid down as fast as built. The maps of Pennsylvania, Indiana and New Jersey are already sufficiently advanced to present most interesting facts, and those of other States are progressing.

ALASKA.—The Governor of Alaska, in his Report to the Secretary of the Interior, 1895, gives an interesting account of his travels, 2,000 miles more or less, westward from Sitka, within the bounds of Alaska. He visited Kadiak, Wood Island, Karluk, Sand Point, Unga, Belkovski and Unalaska.

At Kadiak are now located a deputy Collector of Customs, a U. S. Commissioner, a deputy Marshal, and a good school. At Wood Island (village) are two churches and a school, but only 150 people. At Karluk are about 600 people in the fishing season. There are four large canneries and a school house. The Governor says a Justice of the Peace and a constable would be useful here. At Belkovski are a school house, church and 190 people. Sand Point has a Custom-house, store and warehouse. The deputy Collector, his wife, the storekeeper, and three Russian families make up the town. Unga has a church and school, and 200 people. Unalaska has a deputy Collector, a Commissioner, a deputy Marshal, three school houses, a church and 300 inhabitants. It is the headquarters for whalers and Government vessels; also the central point of the Alaska Commercial Company. The Island of St. George has a population of about 100, and St. Paul double that number. The annual census for the past six years shows a gradual increase. On each island there is a church and a school house. Population, church and school house would probably all disappear with the extinction of the seal fisheries.

The amount of gold produced from the mines of Alaska during the past year has done much to confirm the opinion that this territory will be a permanent mining country. There are indications that the valley of the Yukon River is the most extensive field of placer mines discovered since the finding of gold in California. It is estimated that there are about 1,500 miners living in that part of Alaska. The miners are about 1,000 miles from Sitka.

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It is not generally known that there is located at Sitka a society having for its object the collection and preservation of specimens illustrative of the natural history and ethnology of Alaska, and publications relating thereto. It has gathered curios and skins, specimens of Indian and Eskimo handiwork, and all sorts of ivory carvings from every part of the Territory. Dr. Sheldon Jackson has furnished the Society with a commodious fire-proof building.

The Commissioner of the General Land Office reports that he has passed upon 101 surveys of public lands in Alaska. There is no Surveyor-General of public lands in this Territory, the functions of that officer devolving upon the U. S. Marshal, without compensation. The results of an investigation by a Government inspector reveal a remarkably alarming condition of methods in conducting public business, for which the present official, however, should not be held responsible.

Mr. Marcus Baker, in a recent address, called attention to the marked deflection of the Alaska boundary line on Canadian maps since 1884. In that year an official map showed the boundary as passing up Behm Canal, an arm of the sea some 60 or 70 miles west of Portland Canal. Another Canadian map three years later carries the line across the head of Lynn Canal in such a manner as to throw its headwaters into British territory. Still later Canadian maps carry the line not across the head of the canal, but near its mouth, some 60 or 70 miles south of the former line.

The Superintendent of the Coast Survey has asked Congress for an additional appropriation of $50,000 for the purpose of running definite lines of demarcation on the Upper Yukon and its tributaries, and to provide for the contingency of surveys which may be required along the boundary in unforeseen localities. The Secretary of State in forwarding the estimate remarks that "The determination and marking of the 141st meridian in that part which by treaty forms the boundary between Alaska and British Columbia is not provided for by any existing treaty, and negotiations to that end may probably be begun in the near future."

Coast Survey.—Tide Tables for the Atlantic and Pacific coast, heretofore issued separately by the Coast Survey, are now consolidated, and extend to the world at large. In the volume for 1896, recently issued, the predicted time and height of every high and every low water throughout the year are given for seventy principal ports or stations. These predictions are extended to about three thousand subordinate stations by means of tidal differences and ratios.

The Coast Survey has completed the triangulation along the line of the 39th parallel from the Atlantic to the Pacific Ocean. This means a great deal to astronomers and geographers.

HYDROGRAPHIC OFFICE.—The expansion of the work of the U. S. Hydrographic Office is mainly on the Great Lakes and Pacific Ocean. The character of the work in the first named direction has caused it to meet with general approval. The policy of the office, says Capt. Sigsbee, is to shape its work and publications so strictly to nautical needs as to avoid, as far as possible, duplicating the work already well done by other branches of the Government. It is remarkable that the immense commercial interests of the Great Lakes had not sooner received benefits similar to those conferred by the Government on the commerce of the seas. A Pilot Chart (similar in scope to the North Atlantic and North Pacific Pilot Charts), Sailing Directions, Sailing Charts, and Notices to Mariners for the Great Lakes, have been issued for the first time during the past year.

A trial issue of the Pilot Chart of the North Pacific was made in January, 1894. Its issue as a permanent publication was authorized by Congress in the same year. The first regular issue was in July. August was omitted, but since that time it has regularly appeared. It may be long before it reaches the plane occupied by the North Atlantic Chart; but this condition is due entirely to the lack of observers cruising in the Pacific.

The Hydrographic Office desires to construct trustworthy charts of the north coast of South America, where the interests of United States commerce are increasing. The stretch of coast lying to the westward of the mouth of the Orinoco River, which is unsurveyed and about which little is known, is more than 500 miles in length.

UTAH.—The forty-fifth State comes into the Union with a population of 247,324,—less than that of the District of Columbia, or of Oklahoma, but many times larger than that of Nevada.

The latest official accounts from the Territory presents satisfactory conditions of industrial resources and a somewhat phenomenal development of commercial interests. All the Federal officials agree in the opinion that polygamy is dead beyond the possibility of even an attempted resurrection.

NEW MEXICO.—W. T. Thornton, Governor of this Territory, claims, in his late Report to the Secretary of the Interior, that there is no portion of the Union possessing such splendid climatic conditions as exist in that Territory. No extremes of heat or cold,

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with clear, bright skies. He quotes the following records from the U. S. Weather Office at Santa Fé:

	1892.	1893.	1894.
Average temperature, degrees	49.1	49.4	48.9
Maximum temperature, "	90.	89.	86.
Minimum temperature, "	1.	5.	0.
Average relative humidity, per cent	43.	38.	41.
Total rainfall, inches	11.62	14.94	13.31
Number of cloudless days	248.	235.	213.

NOTES.—"Highways of Commerce," is the title of the State Department Guide Book which will supply to merchants, travellers and students authentic information concerning the great highways of traffic and travel in foreign countries. It is a valuable compilation. No traffic line is mentioned unless it carries passengers, through mails or freight in considerable quantities; nor are subsidiary or military lines discussed.

There is a vast amount of information in this 800-page volume. Without being confronted with weary pages of statistical tables, the reader will find, under the name of any country on the globe, a concise account of its railway, navigable water-way, and highway facilities; rates of fare and freight; and numerous maps of railway, steamship, and river routes.

In the apportionment of railway lines by continents, America occupies the first rank, having 31,394½ miles more than the remainder of the world. The average cost of European lines has been $121,260.88 per mile; in the United States, $59,298.12. The cheapest railways are in Australia, where, in the western portion, the price has been as low as $21,723 per mile.

Under legislation of the last Congress, all military records, such as muster and pay rolls, orders, and reports relating to the personnel or the operations of the armies of the Revolutionary War and of the War of 1812 have been transferred to the War Department to be preserved, indexed, and prepared for publication. A large mass has been so transferred and the records relating to the personnel of the Revolutionary War have been indexed and arranged for use. The recent revival of interest in matters pertaining to the Revolution, due largely to the efforts of the various patriotic societies, has given rise to a steadily increasing demand for information from the military records of that war. The Department is now answering promptly all inquiries relative to officers and enlisted

men, and is furnishing so much of the military history of those whose names are borne on the rolls as is afforded by the rolls themselves.

It is estimated that there is enough original manuscript selected from the naval records of the Civil War to make between 20 and 30 volumes. Volume 2 has appeared, and two more volumes are expected soon. The demand for this publication has been large. The reports of Union commanders are full and fairly complete. The Confederate records are not equally complete, due to the great difficulty found in collecting them, and also to the fact that a large part of the archives of the Confederate Navy Department was burned at the close of the war.

The concluding volumes of the first Series of the Records of the Union and Confederate armies are nearly in type. The second Series, relating to prisoners of war, has been begun, and the first volume well advanced in printing. H.

GEOGRAPHICAL NOTES.

BY

GEO. C. HURLBUT, *Librarian.*

THE GREATEST DEPTH OF THE OCEAN.—Adm. W. J. L. Wharton, R. N., sends the following letter to *Nature*, of October 3:

A deeper spot in the ocean than any yet known has been recently found by H. M. surveying ship *Penguin*. Unfortunately the observation was not complete, as a fault in the wire caused it to break when 4,900 fathoms had run out without bottom having been reached.

Commander Balfour reports that this occurred in lat. 23° 40′ S., long. 175° 10′ W., about 60 miles north of a sounding of 4,428 fathoms obtained by Capt. Aldrich in 1888. A previous attempt to reach bottom had been foiled by a similar accident to the wire when 4,300 fathoms had passed out, and the rising wind and sea prevented any further attempt at the time. As the deepest cast hitherto obtained is one of 4,655 fathoms near Japan, it is at any rate certain that the depth at the position named is at least 245 fathoms greater.

It is hoped that before long a more successful attempt to find the actual depth will be made.

The sounding of 4,655 fathoms was made in the *Tuscarora* in 1874, by Commander, now Rear-Admiral, Belknap, U. S. N., who expressed himself as follows, in a letter written to the New York *Sun*, from Brookline, Mass., under date of November 18, 1895:

Referring to the brief mention in the *Sun* of the 15th inst. of the deep-sea sounding made by Commander Balfour of H. B. M. S. *Penguin*, in that region of the South Pacific a little south of the Tonga, or Friendly Islands, let me say that in so far as I have been able to gather the facts of that sounding, the actual depth was not determined at all. The wire broke when 4,900 fathoms had run out without giving any sign of the sinker having touched bottom. In a previous attempt of the *Penguin* in that locality, the wire had broken when 4,300 fathoms had run off the drum. The brief report of those soundings, printed in *Nature*, gives no hint as to whether the undercurrents of the ocean entered in any way into the incidents of those deep casts, though mention is made of strong wind and considerable sea.

The *Tuscarora*, when sounding off the east coast of Japan in 1874, and at a distance of about 100 miles from the land, had the wire break when 4,643 fathoms had run out. In that case the current of the Black Stream of Japan swept the wire from the perpendicular and, by the stress of its flow, not only prevented a correct sounding, but caused the wire to part.

No further effort was made to get at the depth in that locality, for there was neither time nor wire to spare for that purpose; nor was it believed that a submarine cable could be successfully laid in such deep water swept by so strong a current.

In the *Tuscarora's* experience the ocean undercurrents played strange freaks now and then with the wire. The trend of the wire would change in direction, and some-

times a movement would be observed, as though a big fish had seized the sinker in his mouth and was swimming off with it.

The scene of the recent deep-sea soundings of the *Penguin*—the deep submarine valley in the neighborhood of the Friendly and Cook Islands, which would seem to be as remarkable as the great depression of the ocean bed discovered by the *Tuscarora* off the east coast of Japan in 1874—was first indicated by H. B. M. S. *Egeria*, Capt. Pelham Aldrich, R. N., in 1888, when several soundings in depths of over 4,000 fathoms were made, the deepest being in 4,428 fathoms. The next year, 1889, Commander C. F. Oldham, R. N., who had relieved Capt. Aldrich in command of the *Egeria*, had the good fortune to find still deeper water, a depth of 4,530 fathoms, in that region of ocean.

It is a notable fact that the *Challenger*, in her tracks in the South Pacific on her famous expedition round the world, 1872–76, just missed the great trough developed by the work of the *Egeria* and *Penguin*. Indeed, up to the date of the *Egeria's* work in the South Pacific the greatest depth found south of the equator, either in the Atlantic or the Pacific, had been sounded by the U. S. S. *Alaska*, Capt. Belknap, in July, 1881, about 100 miles west of Callao Bay, Peru, where a depth of 3,367 fathoms was disclosed. . . . . .

THE GEOGRAPHICAL SOCIETY OF LISBON is duly authorized to announce that in the year 1897 the Portuguese nation, under the presidency of the King and his government, will commemorate with public rejoicings and with every possible solemnity the departure from Lisbon of the expedition commanded by Vasco da Gama, which opened the ocean highway to the Orient.

The general plan of the celebration, elaborated by the Geographical Society, has received the approval of the Government and will be made known in a future communication.

AUTOGRAPH LETTERS OF MERCATOR.—Lieut. F. Van Ortroy prints, in Vol. IV, No. 3, Fifth Series of the *Compte Rendu* of the Royal Historical Commission (Belgium), four autograph letters addressed by Mercator in 1585 and 1586 to Henry von Rantzau, governor of Schleswig and of Holstein. The originals are preserved in the Palatine Library at Vienna. All were written at Duisburg.

The first letter has no special interest. In the second and third Mercator refers to the astrological studies, to which von Rantzau devoted himself, and points out to him in one place that, in making predictions for the year 1588, he will do well to note the fact that with it closes a period of 70 years from the first utterance of their doctrines by Luther and Zwingli, and that this period is to be compared with the 70 years of the Babylonish Captivity.

The fourth letter acknowledges the receipt of a gift from von Rantzau, and describes the progress of the maps on which Mercator

was then engaged, and the expected arrival of some documents relating to Poland and Livonia;

When these come to hand—he says—I shall set to work and measure everything exactly.

It is in this regard for accuracy, as Lieut. Van Ortroy remarks, that the merit of Mercator consists.

This letter was written in the midst of tumults. Alexander Farnese had just taken Neuss by storm, and the picture of the war then raging is drawn in a few lines:

There is nothing new here, except that all things are miserable, where once we enjoyed the greatest peace and tranquillity. It is a cruel war, in which no one is spared; whether friends or neutrals, all are treated alike; hunger and scarcity of bread on every hand; and unless God put an end to the war, it is feared that very many will die of starvation, especially in France where, they say, the corn crop has been very short this year.*

THE ANDREA BIANCO MAP OF 1448, AND A SUPPOSED DISCOVERY OF BRAZIL IN 1447.—Under this title Signor Carlo Errera presents, in the *Memorie* of the Italian Geographical Society, Vol. V, Part 1, a careful study of this early map, which is preserved in the Ambrosian Library at Milan.

It is upon his interpretation of an inscription in this document that Mr. H. Yule Oldham constructs his theory of a Portuguese discovery of America, 45 years before the First Voyage of Columbus.†

The map is unique among Italian charts of the Middle Ages in that it is intended to represent only the western coast of Europe and Africa, and does not take in the basin of the Mediterranean. The European coast is shown from Heligoland to the Straits of Gibraltar, and the coast of Africa from the Straits to the farthest southern limit then known. Beyond the coast nothing is marked except, in Europe, a few river cities, and, in Africa, some water courses and imaginary mountains in the interior.

The Atlantic islands are delineated, with the errors characteristic of the cartography of the period. Scotland stretches so far to the north that it is cut off by the upper edge of the map. Its higher coast is without a name, and on the west appears only the Solway

* Novi hic nihil est, nisi quod tristia sunt omnia ubi summa pax et tranquillitas esse solet. Bellum crudele, in quo nulli parcitur; sit amicus, sit neutralis, aequa sorte tractantur omnes; fames et magna caritas panis ubique; et nisi abbreviet Dominus bellum hoc, quam plurimos inedia perituros timetur, praecipue in Gallia, ubi hoc anno exiguum admodum frumenti proventum fuisse aiunt.

† A Pre-Columban Discovery of America, by H. Yule Oldham, M.A.—(*The Geographical Journal*, March, 1895.)

Firth. A strait from sea to sea separates Scotland from England. Ireland is much the same as in other maps of the time, but Bianco has added a good many names to the chain of islands drawn along its coast to the extreme south-western point.

In the representation of the Azores there is a change, introduced for the first time. All previous maps show these islands in three groups arranged along the same axis from north to south. These groups reappear in the map of 1448, and in addition to them, west of the coast line from Cape Finisterre to Cape Roca, are two others, one of five islands, the other, south of it, of two, and all lying north-west and south-east. These two groups are almost in the true position of the central and eastern Azores, which, in Signor Errera's opinion, they undoubtedly represent, according to the recent re-discovery by the Portuguese; the original three groups of the earlier maps being retained, because it was not then known that the new islands were identical with those already laid down off the Portuguese coast.

There is nothing noteworthy in the delineation of the Madeira and Canary Islands.

Greater care is bestowed upon the African coasts than upon those of Europe, and it is in this part of the map that the inscription is found, to which so much importance is attached. It occurs within an outline of coast, about 200 miles in a south-westerly direction from Cape Verde, at the very edge of the parchment.*

According to C. Desimoni (*Atti della Società Ligure di Storia Patria, Vol. III, pp. cxiii–cxv, Genova, 1864*) the inscription reads:

A xola otinticha. Xe longa a ponente 1500 mia.

In the *Studj biografici e bibliografici sulla Storia della Geografia in Italia, Vol. II, p. 72*, is the following mutilated form:

ixole otintiche 1500.

In the reproduction of the map, published by Dr. T. Fischer (*Sammlung mittelalterlicher Welt-und Seekarten italienischen Ursprungs, u.s.w., Venedig, MDCCCLXXXVI*), the inscription takes this shape:

ixola otinticha ‖ X e longa a ponente 1500 mia.

Mr. Yule Oldham's reading is:

ixola otinticha xe longa a ponente 1500 mia.

According to Signor Errera the true reading of these words is:

ixola otinticha ‖ xe longa a ponēte | 500 | mia.

* Previous readings were from photographic copies of the map. Signor Errera has had the good fortune to examine the original, which is clear and in good condition.

Mr. Oldham translates his text: *authentic island is distant 1500 miles to the west;* and this island he identifies with Brazil. Signor Errera thinks it not impossible that *otinticha* may be one of the many fantastic and unmeaning names which people the unknown Atlantic in the early charts; but he is ready to admit the sense attached to it as a form of the word *autentica.* There, however, he parts company with Mr. Oldham. The reading, *1500 mia*, is shown to be erroneous. In the original map the true figures—500—are marked off, according to the practice of the time, by an upright stroke at each end, but in the copies the second stroke seems to have been overlooked.*

The word *longa* in the inscription is translated *distant* by Mr. Oldham. According to this, *otinticha* is distant 500 miles to the west from Cape Verde, the nearest point on the African coast; but, measured by the scale of the map, the distance is only about 180† miles, and the direction, instead of west, is south-west.

If the word *longa* is to bear the usual meaning of *long* and to describe the extent of *otinticha* itself, as represented on the map, it is inaccurate, for the coast has a westerly extension of not more than 250 miles.

Mr. Oldham maintains that *otinticha* is the most easterly point of Brazil, which may be assumed to be Cape San Roque. From this point to Cape Verde the actual distance is 1,800 miles, or ten times that indicated on the Bianco map. The result of Signor Errera's examination is to relegate the *ixola otinticha* to the world of dreams.

For him, neither the Bianco map of 1448 nor Antonio Galvano's *Discoveries of the World* affords any support to the theory of a Portuguese pre-Columbian discovery of America.

He objects to this theory certain established facts: that the Portuguese of the fifteenth century had absolutely no knowledge of a land to the south-west; that Bianco's mysterious island is not to be found on any of their maps; that their historians are silent on the subject;‡ and that Cabral's accidental discovery of Brazil in the year 1500 took the Government and the nation by surprise.

This should be final, but no man lives to see the end of a theory.

THE JACKSON-HARMSWORTH EXPEDITION.—The steamer *Windward*, which carried this expedition to Franz Josef Land in the

* It appears, none the less, quite distinctly in Dr. Fischer's photographic reproduction of the map, in the library of the American Geographical Society.

† The text reads: *100 miglia*; evidently a printer's error.

‡ Galvano died in 1557, at the age of 54. His compilation, made not long before his death, first appeared in 1563.

summer of 1894, arrived at Gravesend on the 22d of October last, with a report of the year's work.

The party landed at Cape Flora, on Northbrook Island, on the 10th of September, last year, and erected houses. Winter set in soon after. The first care was to secure a supply of fresh meat, and in this Mr. Jackson met with success, the bears and walruses furnishing enough to keep the men in good health for the winter months.

The Archangel house, which was christened *Elmwood* after Mrs. Harmsworth's place in Kent, was found to be an extremely comfortable dwelling. It was built of logs twelve inches square and lined throughout with felt. It was twenty feet square inside, with double windows and double roof, and it gave perfect protection against the weather. The bears sometimes looked in at the window and even rubbed their heads on the glass, but they never tried to break in.

The sun returned, February 23, and on the 10th of March Mr. Jackson and two others started to the northward.

They reached Peterhead, at the entrance to Markham Sound, after four days' journey through fog and driving snow, with the thermometer at 45° below zero. The ponies, which Mr. Jackson had taken with him, stood the climate very well and did excellent service. Mr. Jackson describes the country as

"covered with a perpetual ice sheet, only interrupted at long intervals along the coast by lofty basaltic cliffs, having a steep talus of loose stones and soil. On this are found many sedges, mosses, and Arctic flowering plants, which form a contrast to the snow-covered slopes above as striking as it is pleasant. The country generally is well elevated, attaining an average height of 2,500 feet above the sea One of the most interesting facts connected with the coast is the number of old sea beaches, some of them being as high as 120 feet above the present shore.

Three depots of stores were established and two boats were left at a point in latitude 81° 20′, for use in the summer.

A second and even harder journey was made in April and May. Many observations for latitude and longitude were taken and geological specimens were collected. Much of the work of the Austrian expedition was found to be inaccurate. On this point Mr. Jackson expresses himself in the following language:

We have entirely altered the map and character of a great portion of Franz Josef Land, and have found a sea and islands where mainland was supposed to exist. We have also carefully mapped Markham Sound, and, of course, laid down our route to the furthest point we reached, 81° 20′ north. Markham Sound and the country further north are totally different from what Payer's map represents them to be, and the character of the small portion of Zichy Land, which borders on Markham Sound, is absolutely unlike the description published in the narative of the Austro-Hungarian

expedition. Moreover, the mountains in that work cannot be observed even on the clearest day.

The *Windward* will return to Franz Josef Land in June, 1896, with a reinforcement of picked men, and supplies for two years.

ANTARCTIC EXPLORATION.—The *London Times* of Nov. 29 has the following announcement:

We learn with regret that the First Lord of the Admiralty has intimated that he would rather not receive a deputation at the present time on the subject of the renewal of Antarctic exploration under Government auspices. We believe the reason is that all the men and all the resources of the Navy are at present required to place our Fleet in a state of efficiency. The committee that has taken the lead in this movement will possibly decide to make an effort to interest the nation so far as to lead to a subscription sufficient to send out an expedition prepared to do two or three years' continuous work.

THE UNITED STATES BOARD ON GEOGRAPHIC NAMES.—This Board has just issued its Second Report containing the decisions rendered from January, 1892, to September, 1895. Two previous decisions are reversed.

Golovin Sound (Alaska), of the First Report, is changed to GOLOFNIN SOUND, and Woods Holl (south-eastern Massachusetts) is now to be written WOODS HOLE, to the comfort of the stranger, and the dismay of the local patriot.

According to the Executive order constituting the Board, its decisions are to be accepted by the Departments of the Government as the standard authority. Beyond this limit there is evidently no attempt at uniformity in the spelling of geographic names, and the time devoted to the consideration of the subject in geographical congresses cannot be said to have been well spent.

The public is of Dogberry's mind, that to write and read comes by nature, and it will not learn.

Even within a limited sphere, the difficulties in the way of consistent usage are very great, and the conflict of rules is sometimes fatal to one or the other, or both.

The policy of the Board on Geographic Names is set forth at length in the introduction to the First Report. It is there stated (p. 7) among other principles, that

The forms of foreign names recommended for adoption are determined on consultation of established usage, the best authorities upon ethnological and political history and derivation, and current geographic and political information from authentic sources. . . . . It (the Board) hopes, however, that the way may be opened in the near future to the adoption throughout of the local forms of these names, and the rejection of the anglicized forms. In such specific cases as have been brought to its attention, it has decided uniformly in favor of the local form.

This local form is defined as that in use by the best authorities in the country having jurisdiction.

This accounts for *Kaffraria*, and *Kamerun* and *Massaua*, but it says nothing for *Kongo* and *Nova Zembla*.

The Portuguese form, Congo, has in its favour four centuries of history, the practice of all nations until within a few years, and the stamp of recognition by the authorities of the French Congo and the Congo State. Why is *Kongo* preferred?

Nova Zembla has prescription for it; but what becomes of respect for the local form, Novaya Zemlia, now almost universally adopted?

The work of the Board has been prosecuted under hard conditions. The members serve without compensation, and it does not appear that provision is made for the publication of their reports.

The total number of decisions is 5,364, including 2,791 names of counties in the United States. These are printed on pp. 47–56 of the First Report.

THE BOLLETTINO OF THE ITALIAN GEOGRAPHICAL SOCIETY, in a note on the Italian population of New York, makes the following statement:

> The American statistics cannot be taken as a basis. It will be sufficient to quote the fact that the census of 1890 gave only 182,000 Italians living in the United States, while it is certain that the number then approached and now exceeds 500,000.*

A wise man has said that nothing is certain, but death and taxes. There may be, at the present time, 500,000 Italians in the United States, but the number of 182,580 in the Census returns of 1890 is nevertheless to be accepted with confidence.

The Italian immigration was for many years insignificant. It amounted for the 60 years, 1821–1880, to 87,774, according to the statistics of the Italian Government,† but according to the tabulated statement in the U. S. Census Report for 1890 (*Population, Part I, p. lxxx.*) the total was 81,249. The difference is accounted for by the immigration into Canada and British Columbia, which are frequently included, in the Italian returns, with the United States, and in some degree by the fact that the American Census is taken in the middle of the calendar year.

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* Non si possono prendere per base le statistiche americane; basterà citare come il censimento del 1890 dasse per residenti agli Stati-Uniti soli 182,000 Italiani, mentre è certo che allora avvicinavano e ora passano il mezzo milione.

(Bollettino della Soc. Geog. Italiana, Ser. iii, Vol. viii, Fas. x, p. 325.)

† The figures are taken from the *Statistica della Emigrazione Italiana all'Estero nel 1881, confrontata con quella degli Anni Precedenti, ecc. Roma, 1882:* Published by the *Direzione della Statistica Generale.*

In 1880 the number of resident Italians was 44,230. There were added to these in the next 10 years 208,792, and the apparent total for the year 1890 is, therefore, 253,022.

From this total must be deducted, however, the mortality for the 10 years, and the immigration into Canada.*

It is well known that for the most part the Italians take up their abode in the large cities of the country. The annual death-rate of the white population in 12 of these cities, was:†

Newark	28.67	per 1,000
New York	28.47	" "
Chicago	21.03	" "
Philadelphia	22.28	" "
Brooklyn	25.41	" "
St. Louis	18.15	" "
Boston	24.62	" "
San Francisco	23.57	" "
New Orleans	25.41	" "
Buffalo	19.83	" "
Baltimore	22.61	" "
Pittsburg	21.56	" "

The average of these figures is 23.47; but those who are acquainted with the conditions of Italian life in America cannot doubt that the death-rate among people of that nationality is very nearly as high as that recorded for the City of New York. If the annual rate were no higher than 23.47 per 1,000, it would account for 59,353 persons of the apparent total for 1890, and leave 11,089 for the Canadian quota. If the death-rate is estimated at 27 per 1,000, the apparent total for 1890 will be reduced to 184,712, which exceeds the Census figures for 1890 by 2,132 persons, to be looked for in Canada and British Columbia.

There has been a great increase in the volume of the immigration for the past five years. The *Almanach de Gotha* for 1895, taking its figures from the Italian official publication, makes the number of departures for the United States alone, in the four years, 1890–1893, 185,029. An approximate total for the beginning of the year 1895 may be reached by adding together these figures:

Census return for 1890	182,580
Immigration, 1890–1893	185,029
Estimate for 1894	50,000
	417,609

* This latter, though an unknown quantity, must not be forgotten.

† Compendium of the Eleventh Census, 1890. Part II, Miscellaneous Statistics, p. 5.

In a question of this kind, it does not appear that any other authority can take the place of the official census.

EXPLORATION OF TALAMANCA.*—The report of this exploration, performed by the late William M. Gabb in 1873–1874, is now published for the first time in this translation from the English manuscript. It is preceded by an introduction in which Señor Pittier, the director of the *Instituto*, pays a tribute to the memory of Mr. Gabb, and an appendix contains a classified list of the batrachia and reptilia collected, and described in 1875 by Dr. E. Cope, of Philadelphia.

The district of Talamanca occupies the south-eastern corner of Costa Rica.

It is watered by the rivers Tilorio, or Changuinola, and Tiliri, or Sixsola,† and along the coast the land is low and marshy, behind a narrow strip of sand thrown up by the sea.

In the interior the land rises rapidly and the hills sometimes reach a height of thousands of feet. In the lowlands the water covers the earth in the rainy season to a depth of ten feet. Near the coast grows a dense vegetation of dwarf palms, and in the driest spots the agave flourishes.

In the centre of Talamanca, on the Tiliri River and about the mouths of its principal tributaries, there is an area of undulating plains, covering between 100 and 150 square miles of soil, for the most part sandy, even rocky in some places, and in others showing beds of clay. This region needs only to be cleared of its forests to become agricultural land of the best quality.

The rising ground is of uniform character. Except in the valley of Cabécar, the hills of Talamanca have very narrow crests, only a few feet in width, and the sides slope at so steep an angle that it is no easy matter to find a piece of ground suitable for cultivation. Urén, the most thickly peopled district, is almost stripped of forests and is laid out in plantations of maize, plantains and sugar cane and in pasture lands, where not even a stump of a tree appears.

Bribrí, on the Larí River, probably the Biceita of the Spaniards, resembles Urén in its features, but is much less developed.

Cabécar extends to the sources of the river Coén. At the beginning of the 18th century it was the centre of a most important

* Anales del Instituto Fisico-Geografico Nacional de Costa Rica. Tomo V. 1892, pp. 71–90. 4to. San José de Costa Rica, 1895

† Tilorio and Tiliri are the native names and Gabb uses them in preference to the others, which are of Mosquito origin.

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colony. It was united by a good road to Cartago, and it is said that very rich mines existed in the neighborhood; but the indications are that the principal industry of those days was stock-raising. Situated as it is in the heart of the cordillera Cabécar might easily be made accessible. A road of 25 miles in length would bring it into communication with the Tiliri River, at the point where it is permanently navigable and practically unaffected by the freshets of the rainy season.

The soil is the richest in Talamanca, composed as it is of the same black earth which supports the famous coffee plantations around the city of San José.

At the head-waters of the Taberí, which are reached by following the old Spanish road, the country puts on another aspect, of rugged mountains covered with impenetrable woods. Except by a few Indians, descendants of the refugees of 1709, the region is uninhabited.

The valley of the Tilorio River is narrow and precipitous and the whole population is reduced to one hundred and three persons. The river bed is so full of rocks that navigation is out of the question, and the descent to the banks is excessively steep.

In the Zhorquin valley, however, there are some good farming lands and the remains of former plantations testify to a comparatively dense population, now disappeared.

According to the natives, the Tilorio takes its rise in a lake on the bare top of a mountain, once a volcano.

Mr. Gabb made the ascent of the Pico Blanco, previously unattempted. He followed the hunter's track along the mountain ridge between the Urén and the Larí, scaling precipices, clinging to the face of the rocks and crossing gullies by improvised bridges. The party was composed of twenty-one persons, mostly carriers, and the peak was reached after seven days' struggle through the dark, wet forest.

The Pico Blanco, the highest point of Talamanca, has an elevation of 9,562 feet. The Urén drains the north-eastern slope, while the Larí receives the waters of the northern side. The streams that descend the southern slope flow into the Pacific.

It has always been asserted that the Irazú (near Cartago) is the only mountain from which both oceans may be seen at the same time. The view from the Pico Blanco is incomparably more extended. The stretch of the Caribbean between Limon and Puerto Viejo was clearly visible, together with the islet of Uvita and the breakers on the reefs of Punta Cajuita; while, on the other hand,

the Pacific Ocean, thirty or forty miles distant, seemed to be at the feet of the observer. From the summit the crest descends rapidly for some miles till it is not much more than 3,000 to 3,500 feet above the sea. It then rises again, to sink once more between the Diparí and the upper valley of the Coén, which is dominated by a remarkably beautiful peak. Beyond this depression, the crest has a medium altitude of between six thousand and seven thousand feet.*

The climate of Talamanca differs little from that of other parts of the country. It is very unhealthy near the coast and on the lower course of the streams, and the fevers are frequently fatal, even to the Indians; but in the interior natives of northern Europe and America easily become acclimated, on the single condition of living with prudence.

In the higher regions the climate is in every respect a good one, and the valleys of the Urén, Bribrí and Cabécar are admirably suited to the people of the temperate zone.

There are two dry and two wet seasons of the normal year. The rains begin in May or June and last till the end of July; August and September are dry; showers fall now and then in October, and the next three months bring abundant rain; February, March and April are one long, dry season.

A large part of the Report is devoted to the geology of this interesting region. Briefly described, it is of recent sedimentary rocks, almost all metamorphic, and at various points on the coast small masses of yet more recent rock make their appearance.

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* Señor Pittier makes the following comment on this passage :

" This description of the part of the Cordillera of Talamanca which is to the north-westward of the Pico Blanco does not agree with the facts. The maps of the English Admiralty assign to that peak an altitude of 10,200 feet (3,109 m.), but I hold to the opinion that the figure given in the present Report more nearly approaches to the truth because I have had an opportunity to compare the barometer (made by Green) with which Gabb conducted his observations, and in addition to this the revision of the original calculations, which also came into my hands by accident, convinced me of their accuracy and of the correctness of the process followed in the operations. But it may be affirmed that in the whole of the main Cordillera of Costa Rica, from the Pico Blanco to the Cuello de las Cañas, there exists no depression lower than 5,000 feet, or about 1,500 metres. Moreover, the Pico Blanco is by no means the most lofty summit of Talamanca. The Cerro de Buena Vista, which occupies nearly the position of the Cerro de la Laguna, or Montaña Dota, in the maps of Gabb and his predecessors, is 3,299 metres (10,824 feet) in height; the Chirripó Grande, the Mount Walker of the North American hydrographers, which lifts its mighty mass to the west of San José de Cabécar, towards the head-waters of the Boali, undoubtedly surpasses it, and the mean level of the main Cordillera exceeds 7,000 feet (2,100 metres).

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The nucleus of the great interior Cordillera consists of granite and syenite, traversed by dykes of volcanic origin, identical with those of northern Costa Rica.

THE INSTITUTO GEOLÓGICO DE MÉXICO announces the death of its founder and director, Don Antonio del Castillo, in the City of Mexico, on the 27th of October last.

POPULATION OF BERLIN.—A census, taken on the 2d of December, showed that the population of Berlin was 1,674,112. The increase for the five years, 1880–1885, was 16 per cent.; that for the period 1885–1890 was 20 per cent.; and for 1890–1895 only 6 per cent. This falling off is explained by the growth of the suburbs.

MISS KINGSLEY IN WEST AFRICA.—The London *Times* of December 6 reports the adventures of an English lady, Miss Kingsley, who left Liverpool a year ago to travel for the second time in West Africa for the purpose of collecting specimens of the fishes and studying, at the same time, the customs of the natives.

Landing at Old Calabar, Miss Kingsley proceeded to the French Congo and expressed her desire to explore the gorilla country and to ascend the Ogowe River. The authorities could not guarantee safe navigation beyond Lambaréné, 130 miles from the sea.

The start was made in a canoe with a crew of eight men. The canoe was upset many times in the rapids, and there were several occasions when Miss Kingsley barely escaped with her life.

Travelling overland through the country of the cannibal Fans (Fangwe), the party found every town in a state of defence, and at each one the people stopped the expedition and wanted to eat the three Fans, elephant men, who were with Miss Kingsley. In all this country there was no burial place, but in most of the mud huts pieces of human flesh were kept for provisions.

Many large gorillas were seen, but they made off as the men approached, except in one case, when the animal attacked and was killed by the elephant men. This gorilla was 5 feet 7 inches in height.

Miss Kingsley crossed the unexplored lake N'Covi (N'Comi ?), which is about 10 miles wide and 15 miles in length. She crossed also the range known as the Sierra de Crystal, which has an altitude of from 6,000 to 8,000 feet,* and is reached through a swampy country.

Returning to the coast of the Gaboon, Miss Kingsley explored

* Previous estimates vary between 1,800 and 3,000 feet.

Corisco Island. She afterwards ascended the Kamerun Mountain, and the Rumpi range, farther to the northward. This range, according to the *Times*, is inhabited up to a height of 7,000 feet, but Kiepert's map ascribes to it an elevation of not more than 6,000 feet * (1,800 metres).

It is probably confounded in the report with the Kamerun, as immediately after it is stated that the great crater is 10,000 feet above the sea, and that there are 70 craters in the Kamerun Mountains.

The fishes collected in this expedition were fresh-water specimens, destined for the British Museum.

THE NOR'-WESTERS OF CANTERBURY.—In the *New Zealand Alpine Journal*, Vol. II, No. 8, the editor, Mr. J. T. Meeson, has a paper on the hot, dry winds that blow from the north-west across the mountains and over the eastern plains of both islands, and are felt in their greatest intensity in the province of Canterbury, in the South Island.

These winds are most frequent in the late spring and summer, from October to March, with their greatest strength, perhaps, in February, at the time of the wheat harvest. The Nor'-Wester comes on as follows: the wind blows for two or three days from the north-east and then dies away, or veers to the north; light, cirrus clouds drift in the upper sky from the north-west; the barometer falls, sometimes very fast, and the thermometer rises. A few hours of delicious weather succeed and then, within twenty-four hours or less, comes the north-west wind, gentle, at first, and even cool, with an occasional warm puff. A beautiful arch of cumulus clouds stretches across the heaven from the north to the west or south-west, and below it the sky is of a peculiar, soft blue. The arch sometimes remains through the storm; sometimes it is dissipated in a few hours. The force of the wind increases to a gale, with clouds of dust and a stifling heat. Vegetation droops and withers, and human beings suffer with lassitude, headache and neuralgia. The mountains, to the west, are covered with black cloud—*the true Föhn wall*—and there heavy rain falls.

This state of things lasts sometimes for days, sometimes for a few hours, when the wind veers to the west, the barometer rises, the thermometer falls, and a cold south-west wind sets in for a

* The map of the Kamerun Coast Region, in the *Mittheilungen aus den Deutschen Schutzgebieten, VIII Band, 1 Heft*, makes the altitude of the Rumpi Berge 1,500 metres (4,921 feet).

time, and often the process begins again. Mr. Meeson regards this hot wind as a true *Föhn*, and he accounts for it in this way: The north-west wind, charged with moisture, strikes the west coast at a temperature of 60° Fahr. By the time it reaches the tops of the mountains at 9,000 feet, it loses 30° of heat, while in descending the eastern side of the mountains it gains 50° and reaches the Canterbury plains as a dry wind, with a temperature of 80° Fahr.* To this temperature is added the heat always developed in front of a cyclone.

The Nor'-Wester is, on the whole, a beneficial agent. Some persons hold that it is essential to the maturity of the wheat crop; it kills or blows away the germs of disease, purifies the atmosphere, melts the snows and plays a great part in the development of animal and vegetable life.

* Julius Hann and others have shown that in ascending and descending wet air loses or gains 1° Fahr. for every 300–400 feet, and dry air 1° for every 183 feet.

BOOK NOTICES.

(*N.B.—It is requested that works submitted for review be addressed to the* EDITOR.)

The English Lakes. With Bathymetrical Maps and Illustrations. By Hugh Robert Mill, D.Sc., F.R.S.E. 8vo. London, 1895.

(*From "The Geographical Journal" for July and August, 1895.*)

Dr. Mill's paper was read before the Royal Geographical Society in June, 1894, and an abstract, accompanied by a discussion, appeared in the *Geographical Journal* for September, 1894.*

The lakes surveyed lie within a circle of 30 miles in diameter, in the famous Lake District of north-western England. Geographically, the district may be described as an elevated land, highest in the centre and furrowed by a series of valleys running from the centre toward the circumference, like the spokes of a wheel. Most of the valleys contain long, narrow lakes, differing in type from the small, round mountain tarns of the district. Until Dr. Mill's survey was undertaken, there had been no attempt to construct definite maps of the basins. Some of the results obtained were printed in tabular form in the BULLETIN of September 30, 1894. †

The largest lakes, Windermere and Ullswater, are divided into distinct basins. In the former, the deep and wide upper part is separated by the island-shoal off Bowness from the narrower and more shallow lower basin; while in Ullswater each of the three reaches of the lake is marked off by a bar. Three of the lakes, Wastwater, Windermere and Coniston, descend below sea-level.

Dr. Mill's paper, which is of permanent value, is illustrated by a general map of the District, on a scale of 3 miles to an inch, 7 other maps on a scale of 2 inches to a mile, and 20 illustrations, mostly from photographs. Each map is accompanied by sections, and shows, besides the lake surroundings, the land contours from the Ordnance Survey. All the maps are carefully tinted.

The Discovery of Australia. A Critical, Documentary and Historic Investigation concerning the Priority of Discovery in Australasia by Europeans before the arrival of Lieut. James Cook, in the "Endeavour," in the year 1770. With Illustrations, Charts, Maps,

* Not 1895, as the Preface reads.

† Journal of the American Geographical Society, Vol. XXVI, p. 394.

Diagrams, etc., Copious Notes, References, Geographical Index and Index to Names. By George Collingridge, Member of the Council of the Royal Geographical Society of Australasia, Sydney, New South Wales, Hon. Corresp. Member of the Royal Geographical Society of Australasia, Melbourne, Victoria, etc., etc., etc., Founder and First Vice-President of the Art Society of New South Wales, Sydney. 4to. Sydney, 1895.

Mr. Collingridge has brought together in this handsome volume practically all the early notices of Australia. He begins with the Chaldean conception of the earth and the Greek traditions, of which he cites the one preserved by Ælian, as translated by Fleming, in 1576, and quoted by Mr. R. H. Major:*

Theopompus declareth that Midas the Phrygian and Selenus were knit in familiaritie and acquaintance. This Selenus was the sonne of a nymphe inferiour to the gods in condition and degree, but superiour to men concerning mortalytie and death. These twaine mingled communication of sundrye thinges. At length, in processe of talke, Selenus tolde Midas of certaine ilandes, named Europia, Asia, and Libia, which the ocean sea circumscribeth and compasseth round about; and that without this worlde there is a continent or parcell of dry lande, which in greatnesse (as hee reported) was infinite and unmeasurable; that it nourished and maintained, by the benefite of the greene medowes and pasture plots, sundrye bigge and mighty beastes; that the men which inhabite the same climate exceede the stature of us twise, and yet the length of there life is not equall to ours; that there be many and divers great citties, manyfold orders and trades of living; that their lawes, statutes, and ordinaunces, are different, or rather clean contrary to ours. Such and lyke thinges dyd he rehearce.

The lines next quoted from Manilius refer to Australia as those from Seneca do to America. Mr. Collingridge just mentions Ptolemy and Strabo, and has no hesitation in deciding that Marco Polo considered *Java and Australia as one*, and called it Java Major.

With the fifteenth century and the maps the field widens, and Mr. Collingridge finds firmer ground, though he accepts Galvano's report of the map brought to Lisbon from Venice in 1428 by Dom Pedro of Portugal.† The notices and delineations, more or less definite, of Australia and the neighboring islands, are followed from year to year with patience and assiduity to this result:

In conclusion, we feel inclined to say with Alexander Dalrymple that "there is nothing new under the sun," and that Australia must have been known from the remotest antiquity.

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* Early Voyages to Terra Australis, now called Australia: etc., etc. Edited, with an Introduction, by R. H. Major, Esq., F.S.A. 8vo. (*Introduction, p. iii.*) London (Hakluyt Society), 1859.

† The Discoveries of the World, etc., etc., by Antonio Galvano, etc. Corrected, etc., by Richard Hakluyt (1601). 8vo (p. 67). London, Hakluyt Society, 1862.

Ecclesiastes seems to have anticipated Dalrymple, and it is far from likely that Australia was known to the remotest antiquity. Midas and Manilius do not meet the requirements of the case. Neither are the indications in the mediæval maps conclusive. Important as they are, it is easy to overestimate their importance where they designate regions as yet unvisited by Europeans.

It is probable, as Mr. Major has shown, that the Portuguese reached Australia in the sixteenth century; but the real discovery, in the usual sense of the word, dates from the year 1606, when Torres sailed through the strait that bears his name, and the Dutch landed at Cape York.

The numerous reproductions of maps in the volume are very well done.

The Land of the Nile Springs, being Chiefly An Account of how we fought Kabarega. By Colonel Sir Henry Colvile, K.C.M.G., C.B., Grenadier Guards. Illustrated by Mr. J. Burrell-Smith and Mr. Twidle from Sketches by the Author and Major Thruston and from photographs by the Author. 8vo. Edward Arnold, London and New York, 1895.

Col. Colvile says in his preface that he wrote, some years ago, an official history of a campaign, and that he has contributed a good deal to Blue Book Literature. He adds:

> I trust that the habits acquired during these experiences may be considered a sufficient excuse for any items of useful information that I may have allowed to slip into the following pages.

It is easy to forgive imaginary sins, but there is no excuse for this book. Col. Colvile's line of march was from Mombasa to the Victoria Nyanza and the Albert Nyanza, and detached expeditions were sent off to the right and to the left. Kabarega kept himself pretty well out of harm's way, after setting his capital on fire before the enemy reached it. The native forces, on both sides, were shy of fighting, the real work being done by the Sudanese, who make good soldiers.

Two maps and a number of fair illustrations enliven this uninteresting story.

Expedición Científica al Popocatepetl. José G. Aguilera y Ezequiel Ordoñez, geólogos de la Comisión Geológica Mexicana. 8vo. México, 1895.

The report of this expedition is dated October, 1894. It begins with a brief description of the country around the City of Mexico

and the hydrographic importance of the Sierra Nevada, also called Sierra de Ahualco, of which Popocatepetl forms the southern extremity. Seen from a distance, the mountain has the form of a cone, interrupted by a lateral peak on the north-western side and another, hardly distinguishable, on the south-west; but, on a nearer view, the regularity disappears, and the volcano presents itself as an elliptical cone, with its major axis in a north-western and south-easterly direction. The summit is obliquely truncated by the enormous crater, the highest wall of which, known as the Pico Mayor, is on the north-western side. The crater forms an ellipse of about 2,000 feet by 1,300, and its depth from the Pico Mayor to the surface of the little lake at the bottom is nearly 1,700 feet.

The mountain belongs to the class of *stratified volcanoes*, in which layers of breccia, sand, ashes, etc., are superimposed upon the lava and are, in turn, covered by a later flow. All the lava-currents of Popocatepetl follow the inclination of the slope of the exterior cone, and this fact supplies the authors with an argument against the conclusion of Felix and Lenk* that the Pico del Fraile, on the side of the mountain, is the remnant of an ancient crater. It appears, on the contrary, to be the result of a process of erosion.

The paper is illustrated by four plates, a geological section of the country between Mexico and Popocatepetl, and a plan showing the formations; both maps in colours.

Projet de Construction d'un Globe Terrestre, à l'échelle du Centmillième, par Elisée Reclus. Pamphlet. (Bruxelles?) 1895.

This pamphlet contains two papers: the one in which M. Reclus unfolds his scheme for the construction of a globe of 1,200 or 1,300 feet in circumference, and another, signed G. G., which presents arguments in favour of the scheme and details of probable cost, manner of erection, etc.

There is no denying the main thesis, that the globe is superior to the map for truthfulness of representation of surfaces and related parts of the earth; but M. Reclus strains his ingenuity to exaggerate the shortcomings of the map. If all that he says on this point is true, there is small consolation left for the subscribers to his Universal Geography, a work begun and carried to completion, it is now confessed, without the means of exact information.

The proposed globe is to be set on some hill, 160 or 170 feet in

* Beiträge zur Geologie und Palæontologie der Republik Mexiko. (Aus: *Palæontographica*, 37.) Stuttgart, 1891.

height, near a great capital, in a building, necessarily vast, but none the less architecturally fine. Stairways and galleries, properly disposed, will give access to any portion of the earth's surface, accurately represented for the first time, and will no doubt be thronged by students from every land.

According to G. G., practical effect may be given to this grand conception at a cost of about four million dollars.

It is not too late to suggest a modification or extension of the plan, in the interest of those who must do their studying in places remote from the fortunate capital which is to possess the model globe. Why may not lesser globes,—satellites, so to speak, of the great earth—of 200 and 100, and even of 50 feet in diameter, be constructed and made to revolve on their own axes from one end of a country to the other, as so many object lessons to young and old? The spherical form lends itself to a number of excellent purposes.

Über die Fortschritte der geographischen Namenkunde. Von Prof. Dr. J. J. Egli in Zürich. (*Geographisches Jahrbuch, 1895.*)

This Report covers the two years 1893 and 1894, and, like the five previously published, furnishes a vast amount of solid information concerning the etymology and derivation of place-names, set forth in a lively and original style.

At the outset Dr. Egli calls attention to two difficulties which hinder the labourer in this field. One is the dilettantism, which puts on the garb of science. It ought to be self-evident that only a German scholar can do profitable work on the place-names of a German district, a Slavic scholar on those of a Slavic region, and that no good purpose is served by gathering together conjectures and opinions and assertions instead of well-ascertained results. Such work has absolutely no value. At the same time, good work may be done by the man without philological knowledge, if only he is mindful of the saying: "Cobbler, stick to your last!" He can still collect names or furnish literary and historical contributions.

The other difficulty is the lack of acquaintance with the literature of the subject. It happens that a writer knows only a few of his ten or twenty predecessors, and those not selected, but picked up by chance, and then opinions long since refuted rise to the surface once more as new knowledge, and correct information is buried. This may well be called a Sisyphus labour, to vex the soul.

In the pages devoted to America (86–89) Dr. Egli notices: the

renewed apparition of the "hobgoblin" story about the native origin of the name *America*, told by T. H. Lambert, A. L. Pinart and Jules Marcou; Ernesto do Canto's paper on the name *Labrador;* Prof. Davidson's identification of names on the Californian coast; Brackebusch's contribution on the names of passes in the Andes of Chile and Argentina; and an article by V. Reyes on the place-names of the Mexican State of Morelos.

He gives, on the authority of the explorer Coudreau, the following explanation of the name Guayana (Guiana):

> The name of the region is formed from that of the tribe *Uayanas*, or *Guayanas;* so the savages called themselves after a great tree.

In his *Nomina Geographica* (second edition) Dr. Egli quotes Varnhagen's rendering of the word: *Guayd-nd*= "We the outlawed people."

On pages 92–93 the Decisions of the United States Board on Geographic Names are criticised. We are left in the dark, it is said, by the omission of the apostrophe in *Georges rock* and *Greens ledge*, whether the true reading is *George's* and *Green's* or *Georges'* and *Greens'*. We find *Sao Paulo* by the side of *São Paulo*, and the bastard form *New Grenada*, and no attention is paid to etymology. The Board seems only to deal with letters; to pick out here an *e* or an *a*, and there an *o* or a *u*, and to reject or retain an *h*.

The Gold Diggings of Cape Horn. A Study of Life in Tierra del Fuego and Patagonia. By John R. Spears. Illustrated. G. P. Putnam's Sons. 8vo. New York and London, 1895.

Mr. Spears visited Patagonia as a reporter of the New York *Sun*, and his work is—so he tells us in his preface—what may properly be called a collection of newspaper sketches rather than the conventional story of a traveller; but the sketches have their value.

The dedication of the book puts the reader on his guard:

> To all who love the red aborigines of the Americas
> As God made them.

No one can doubt that the good Indians have been ill-treated; but, sentimentalism apart, both white and red may be said to have been made by God, and there is, perhaps, more hope of the white men.

The gold diggings never amounted to much, but they attracted the usual floating population to the country, and Punta Arenas, the business centre of the Cape Horn Archipelago, is now, according to Mr. Spears, a town full of enterprising people, who will make their way in the world.

There is an interesting chapter on the Welsh Colony of Chubut, planted in 1865, its ten-years' struggle and complete success, and two others describe the birds and beasts. It appears, from the explanation given by the Gauchos, that Darwin was in error when he concluded that the guanacos sought a favorite spot when about to die.* The Gauchos said that about every three years there was a terrible winter, when the guanacos, to escape the storms, took shelter by thousands under the lee of the bushes, and died there of starvation if the tempest lasted, as it often does, for days at a time.

A great industry in Patagonia is sheep-farming, which may yet be widely extended without disturbing the desert charm of the land, deeply felt and well described by Mr. Spears.

The illustrations, mostly reprints, are effective.

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* Journal of Researches, etc., during the Voyage of H. M. S. Beagle, etc., Chapter VIII.

MAP NOTICES.

Atlas of the United States.

Of the great atlas of the United States by the U. S. Geological Survey, 46 additional sheets have been received, of which 40 are on a scale of 1:62,500, and 5 on a scale of 1:125,000, the remaining one being on a special scale of 1:25,000.

Of this number, no fewer than 24 sheets, more than one-half, are in New York State and are on a scale of 1:62,500. This large number of sheets, which represent 5,400 square miles of the area of the State, are a part of the fruits of co-operation between the State and the U. S. Geological Survey, which was in progress two years ago, and which has, unfortunately, been discontinued. The regions represented by these sheets, each of which comprises some 225 square miles, are indicated by their names. Rouse Point and Mooers are at the northeast corner of the State, Plattsburg and Willsboro are on Lake Champlain, Whitehall, Fort Ann and Cambridge are farther south, on or near the Hudson; Ausable is in the Adirondacks, Stony Island, Watertown, Cape Vincent, Sacketts Harbor and Pulaski, are near the outlet of Ontario. Oriskany, Oneida, Chittenango and Syracuse are on the upper waters of the Mohawk and Oswego Rivers, Ithaca and Elmira are on the south border of the State; Rochester and its neighbor on the north Ontario Beach need no descriptive location; Amsterdam is in the Mohawk Valley, while Catskill and Rhinebeck are in the Hudson Valley. These areas are scattered widely over the State, as is seen, and many regions widely differing in topography and geology are represented.

The Crawford Notch sheet, New Hampshire, 1:62,500, completes a square of 900 square miles comprising the highest and most frequented part of the White Mountains.

The Hickory sheet, 1:125,000, is in the Piedmont region of North Carolina. The Wartburg sheet, Tennessee, 1:125,000, is an example of the wooded Cumberland plateau of East Tennessee. The Bodreau sheet, Louisiana, 1:62,500, completes a large area of the strange topography about the lower Mississippi.

In Florida are five sheets, scale 1:62,500, representing the curiously irregular topography of that little known State. These are known as Citra, Ocala, Panasoffkee, Tsala Apopka and Williston.

In Michigan are found three sheets, scale 1:62,500; one, compiled from the work of the U. S. Lake Survey, upon Isle Royale,

known as Passage Island sheet. The others, Ned Lake and Perch Lake, are on the upper peninsula.

Wisconsin receives one sheet, Baraboo, scale 1:62.500, and Minnesota also one, Duluth. This includes the harbor, formed by the curious bars across the head of Lake Superior, and the high steep bluffs of the north shore.

In North Dakota is one sheet, Savo, 1:62,500, situated in James River Valley; in Nebraska are two, Grand Island and Wood River, both representing sections of the broad valley of the Platte. Our latest Territory, Oklahoma, has one sheet, Kingfisher, 1:125,000, representing the eastern border of the plains. In Texas are two sheets, Sherwood in Central Texas and Marfa in Trans Pecos, Texas, both on scale 1:125,000. The latter represents the broad valleys of the region, intersected by eroded trachyte net ranges. The Aspen sheet, Colorado, 1:62,500, presents an area of the rugged Elk Mountains of that State.

The list closes with the Cripple Creek sheet, Colorado, scale 1:25,000, which represents the topography of the greatest gold-mining camp since the days of '49 in California.

Among the miscellaneous maps issued recently by the U. S. Geological Survey should be mentioned a map of the State of Connecticut, scale 1:125,000, reduced from the large scale sheets of the State. Relief is shown by contours at 100 ft. One issue of this map shows the distribution of woodland in detail over the State. It represents it as scattered in small patches, alternating with areas of open, cultivated land. It is somewhat heavier in the north and especially in the northwest than elsewhere. Altogether about 38 per cent. of the area of the State, or somewhat more than a third, is wooded. Of course, very little of this is original forest; indeed, little of it is old and large enough for lumber, but only for firewood and kindred uses.

Atlas de Géographie Historique. Par une réunion de Professeurs et de Savants, sous la direction géographique de F. Schrader. Paris, Librairie Hachette et Cie, 1895.

Parts 13 and 14 of this important work have been issued. These contain maps showing (Part 13) The East after Alexander; The World in 1789; The Progress of Discovery in the 19th Century; (Part 14) The Byzantine Orient; The French Region at the end of the 10th Century, and The Europe of Louis XIV.

This work will comprise 54 double-page maps, printed in colors, accompanied with text and with a large number of detailed maps, figures and diagrams.

Koninklijk Nederlandsch Meteorologisch Instituut. De Guinea en Equatoriaal Stroomen. J. van Druten. Utrecht, 1895.

This atlas comprises a compilation of all reliable observations of current, water and air temperatures and wind, relating to the Guinea and Equatorial currents, which have been made between latitudes 2 and 24 N. and between longitudes 2 and 29 W. of Greenwich. They are arranged by months, and are grouped and the results stated by "square degrees," *i. e.*, the area included between two consecutive parallels and meridians. There are 5 maps relating to each month. Upon the first is simply a list of the observations collated. Number 2 presents, in each square degree, the resultant of the current observations, distinguishing those of the Equator from those of the Guinea current. Number 3 shows the curves of air temperature; number 4, of the temperature of the surface water, and nnmber 5, the wind directions and velocities and the areas of rain.

The text is limited to an explanation of the maps and no conclusion, from study of them, is attempted. This is regrettable, as the familiarity with the data, which the compiler must have acquired in the course of his work, would make his generalization and deductions of value. But this is a matter of little importance, in comparison with this superb compilation and arrangement of facts.

E. Debes. Neuer Handatlas, uber alle Theile der Erde in 59 Haupt- und weit über 100 Nebenkarten, mit alphabetischen namenverzeichnissen. H. Wagner, und E. Debes, Leipzig.

Parts 16 and 17 of this excellent atlas have been issued. These contain a general map of Asia, maps of north and south and Equatorial Africa, the eastern part of the United States and South America, with detailed maps of special localities.

The work retains its high character.

Atlas der Oesterreichischen Alpenseen mit unterstützung des hohen K. K. Ministeriums für Cultus und Unterricht, herausgegeben von Dr. Albrecht Penck, und Dr. Eduard Richter. Wien, Ed. Hölzel, 1895.

This atlas, of which several parts have been issued, presents detailed maps in contours, upon scales of 1:10,000 to 1:25,000, of the lakes of the Austrian Alps, and their immediate surroundings; together with soundings and the contours of their bottoms. Land relief is further expressed by tints of brown and of the lake bot-

toms by tints of blue. These maps are of great value in a study of the results of glacial action.

"The Times" Atlas, containing 117 pages of maps, and comprising 173 maps, and an alphabetical index to 130,000 names. Published at the office of "The Times," Printing House Square, London, E. C., 1895.

This, the latest addition to the atlases of the world, presents few distinctive points which warrant special mention. Opening with maps of the heavens and the moon, it reaches the earth with plate 3. Published in London, of course the British Empire receives the fullest treatment, and next to that, Western Europe, while our own country is dismissed with three maps, one of the country as a whole, and one each of the Eastern and Western States, upon a slightly larger scale.

Besides general geographic maps the atlas contains climatic, hypsometric, ethnographic and religious maps. The execution of the maps would be worthy of great praise were it not that they are unduly crowded with detail, and much of the lettering is too fine for easy reading.

The index to place names refers to projection squares, not, however, by latitude and longitude, but by numbers and letters. The use of the projection lines for this purpose is, however, a distinct step in advance in this regard.

ACCESSIONS TO THE LIBRARY.

October–December, 1895.

BY PURCHASE.

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London, 1879, 8vo; An Account of the Kingdom of Caubul, etc., by Mountstuart Elphinstone, London, 1842, 2 vols. 8vo; The Industrial Arts of India, by George C. M. Birdwood, London (1880), 2 vols. 8vo; Journey to the North of India, etc., by Lieut. Arthur Conolly, London, 1838, 2 vols. 8vo; Cabool: a Personal Narrative of a Journey, etc., by Lieut.-Col. Sir Alexander Burnes, London, 1843, 8vo; The Ceylon Gazetteer, etc., by Simon Casie Chitty, Ceylon, 1834, 8vo; Rough Notes of a Journey through the Wilderness, from Trinidad to Pará, Brazil, etc., by Henry Alexander Wickham, London, 1872, 8vo; A Journal of a Young Man of Massachusetts, etc., captured at Sea by the British, etc. (by Benjamin Waterhouse), Boston, 1816, 12mo; Deutsches Wörterbuch, Moritz Heyne, 6th Part, Leipzig, 1895, 4to; The Discovery of Australia, by George Collingridge, Sydney, 1895, 4to; In the Wake of Columbus, by Frederick A. Ober, Boston, 1893, 8vo; The Iroquois Trail, or Foot Prints of the Six Nations, by W. M. Beauchamp, Fayetteville, N. Y., 1892, 8vo; Indian Names in New York, by W. M. Beauchamp, Fayetteville, N. Y., 1893, 8vo; A History of the City of Brooklyn and Kings County, by Stephen M. Ostrander, Brooklyn, 1894, 2 vols. 8vo; Italia Antiqua, Philippus Cluverius, Lugduni Batavorum, 1624, 2 vols. folio; Sicilia Antiqua, Philippus Cluverius, Lugduni Batavorum, 1619. folio; Germania Antiqua, Philippus Cluverius, Lugduni Batavorum, 1616, 2 vols. folio; Aus China und Japan, von Rudolph Lindau, Berlin, 1896, 8vo; Britannia, or a Geographical Description of the Kingdoms of England, Scotland and Ireland, etc., Richard Blome, London, 1773, folio; An Introduction to the old English History, a Complete History of England from the First Entrance of the Romans, etc., to the End of the Reign of King Henry III. a Continuation of the Complete History, etc., by Robert Brady, London, 1684–1700, 3 vols. folio; Cosmography and Geography, in two Parts, by Richard Blome, London, 1793, folio; A la Cour de Madagascar, Magie et Diplomatie, par Marius Cazeneuve, Paris, 1896, 12mo; An Historical and Statistical Account of the Bermudas, etc., by William Frith Williams, London, 1848, 8vo; Toonneel des Aardriicx ofte Nieuwe Atlas, Wilhelm & Johann Blaeu, Amsterdam, 1635–1642, 3 vols. folio; Parallel Dictionary: English, Russian, French and German; Russian, French, German and English, St. Petersburg and Carlsruhe, 1850–1853, 2 vols. 8vo; A Catalogue of Bibliographies of Special Subjects in the Boston Public Library, by James Lyman Whitney, Boston, 1890, pr. 8vo; Well-worn Roads of Spain, Holland and Italy, by F. Hopkinson Smith, Boston, 1887, 16mo; Italy, Present

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TRANSACTIONS OF THE SOCIETY.

NOVEMBER–DECEMBER, 1895.

A Regular Meeting of the Society was held at Chickering Hall, Monday, November 18, at 8.30 o'clock P.M.

Vice-President Viele in the chair.

The following persons, recommended by the Council, were elected Fellows of the Society:

ASA A. ALLING, JOSEPH G. BUTLER, JR.,
WALTER S. CARTER, ALLEN S. WILLIAMS,
GRANT SQUIRES.

The Chairman then introduced the speaker of the evening, Maj. Alfred F. Sears, who delivered an address on the Geographic Conditions that make Commercial Cities.

On motion, the Society adjourned.

A Regular Meeting of the Society was held at Chickering Hall, on Monday, December 9, at 8.30 o'clock P.M.

President Daly in the chair.

The President, as one of the Delegates to the Sixth International Geographical Congress, held in London, July 26–August 3 last, added some words to the report printed in the Bulletin of September 30.

The Congress was remarkable for the number and the distinction of the representatives from all countries, for its thorough organization—the work of the Royal Geographical Society—and for the spirit of harmony which marked its deliberationa and discussions. The Exhibition included foreign collections of maps and publications, governmental and private, exhibits of learned societies, collections of paintings and photographs, travelling outfits and equipments, a loan historical collection, and many scientific instruments; forming a display, interesting and instructive in the highest degree.

The Congress unanimously recognized the importance of the following subjects, still presenting themselves, for the most part, as problems: The Mapping of the World on a scale of 1:1,000,000; the Systematic Mapping of Africa; Antarctic Exploration; Inter-

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national Co-operation in the Survey of the Baltic, the North Atlantic and the North Sea; A Uniform System of Seismic Observations; the Dating of all Maps; the State Printed Registration of Literature; and the Constitution of an International Institute of Geographical Science, according to a definitive plan to be submitted to the Seventh International Geographical Congress.

The character of these resolutions shows, what was more and more evident to all who attended the last Congress, that these international gatherings have passed beyond the experimental stage; and have assumed definite consistency as a permanent civilizing force. We must look with satisfaction and encouragement to the meeting of the Seventh Congress, at Berlin, in 1899.

The President then introduced to the Society the speaker of the evening, Dr. Franz Boas, who gave an account of his researches among the Indians, in a Winter's Cruise in British Columbia.

On motion, the Society adjourned.

ANNOUNCEMENT.

The following gentlemen will address the Society, on the dates named:

Jan'y 13. Mr. Cyrus C. Adams, on
Progress in Africa.

Feb'y 10. Civil Eng. R. E. Peary, U. S. N., on
Work in North Greenland in 1894 and 1895.

March 9. Prof. T. C. Mendenhall, on
The Alaska Boundary Question.

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